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Questions of the Day and of the Fray

No. IX

MENDELISM AND THE PROBLEM OF MENTAL DEFECT

III. ON THE GRADUATED CHARACTER OF MENTAL DEFECT AND ON THE NEED FOR STANDARDIZING JUDGMENTS AS TO THE GRADE OF SOCIAL INEFFICIENCY WHICH SHALL INVOLVE SEGREGATION

BY

KARL PEARSON, F.R.S.

WITH FRONTISPIECE AND 23 DIAGRAMS IN THE TEXT

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Photographs of children from various sources, some of whom are mentally defective, some of whom are not. In these cases some of the most normal looking children are defective and some of the most defective looking are normal. The photographs are selected from a number shown at the lecture to illustrate that in the great bulk of mentally defective cases—i. e. those not of special type—there are no obvious stigmata, differentiating them at once from normal children.

MENDELISM AND THE PROBLEM OF MENTAL DEFECT

III. ON THE GRADUATED CHARACTER OF MENTAL DEFECT AND ON THE NEED FOR STANDARDIZING JUDGMENTS AS TO THE GRADE OF SOCIAL INEFFICIENCY WHICH SHALL INVOLVE SEGREGATION

BEING A LECTURE DELIVERED AT THE GALTON LABORATORY, FEBRUARY 10, 1914

BY

KARL PEARSON, F.R.S.

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WITH FRONTISPIECE AND TWENTY-THREE DIAGRAMS

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1914

ON THE GRADUATED CHARACTER OF MENTAL DEFECT AND ON THE NEED FOR STANDARDIZING JUDGMENTS AS TO THE GRADE OF SOCIAL INEFFICIENCY WHICH SHALL INVOLVE SEGREGATION

I AM quite aware that it is very bold for one who has had no direct experience of the mentally defective, either as a school medical officer, or as a teacher in a special school, to stand before you to-night and profess to give his opinion on the subject. But as I grow older I feel more and more the need not only for the *censores morum*, but for *censores scientiarum*, a species of watch-dogs of science, whose duty it shall be not only to insist upon honesty and logic in scientific procedure, but who shall warn the public against appearances of knowledge where we are as yet in a state of ignorance. In this age of self-advertisement, when an individual may become famous in twenty-four hours by aid of the illustrated daily press, there is quackery in science as there is quackery in medicine. And even where there is not quackery there is ignorance and dogma parading before the public as knowledge, and taking its toll from the community by a multiplicity of devices. In many ways the trained scientific mind can warn the public, even when it lacks acquaintance with specialized detail, and this is, above all, the case when the final problem turns on the interpretation of figures. To figures, in my experience, ultimate appeal is invariably made, and too often this appeal is in the inverse ratio of the power present of handling them. After all, the legitimate method in every branch of science is one and the same. The processes of observation and the material handled will differ, but the method of deducing a legitimate conclusion is common to all branches of investigation. It is summed up in the theory of logical inference, in the legitimate association of conceptions drawn from the facts observed. Unfortunately at the present time no theory of what we may term scientific logic is taught to students of science in our universities, and the result is only too patent in 50 per cent. and more of so-called scientific publications.

I am fully aware that with so many tramps about the task of the watch-dog is by no means a pleasant one. He is thought to be quarrelsome for the fun of the fight, and writers rarely see both sides of a scientific controversy, or understand the almost religious hatred which arises in the true man of science when he sees error propagated in high places, and is told, forsooth, that he must not check this error by every means in his power for fear of hurting the feelings of Smith or Brown. There comes also a time when reasoning with error is absurd, when statements are so manifestly idle that they stand not by any force of observation behind them, but by the dead weight of authority. Then the only course open, the only thing which will kill obscurity is ridicule and sarcasm. Remember the years in which Erasmus, Reuchlin, and Agricola struggled by aid of reason alone to overthrow the scholasticism which choked all healthy growth in the mediaeval universities ; then came the *Epistolae obscurorum virorum*—the ever-famous letters reputed to be written by the obscure men, the scholastic theologians, one to another,—and within a couple of years the biting sarcasm of these letters of the younger humanists had freed the universities of Germany from their bondage. The renaissance had triumphed by the ridicule of obscurity, if the ground must first be cleared by the heavy artillery of scholarship and logic brought into the fight by the older humanists. To those who see the changes now taking place in the scientific world there must be a consciousness of a similar renaissance in progress. New scientific methods, new standards of logic and accuracy have fought their way to the front, and both in pure science and in medicine much of the work which may be done in the future on the old lines can only be looked upon as dogma or as quackery. The scientist and the scientific medical man have got to pass through the stage of saying *Ignoramus*, before they can safely assert that they begin to see clearly again.

In no sphere is our ignorance greater, in no sphere can more harm be done by dogmatic statements than in the field of social inquiry, where legislation is liable to follow on dogmas propounded in the name of science.

I propose to take to-night as illustration of my point the subject of feeble-mindedness, the treatment of mentally defective children. Here we might surely assume that our knowledge was considerable, that authorities were in agreement as to the nature, the definition, the treatment, and the source of feeble-mindedness. For surely without such adequate knowledge could the State ever have legis-

lated ? How can we legislate if the very conception of what constitutes feeble-mindedness is still chaotic ?

If we are going to segregate the mentally defective child for life, we must of course have clear ideas of how it is differentiated physically and psychically from the normal child. We must further have clear ideas of the manner and extent to which this differentiated class is produced, by (1) inheritance, (2) improper environment, (3) poisoning from the parental system, as known in the case of syphilis and asserted in the case of alcoholism, and (4) injury or trauma at or after birth.

When I sought for information on these four problems a few years ago, I was at once struck by the extraordinary absence of accurate investigation. I could find :

1. No adequate anthropometric measurement of, say, a thousand mentally defective children, with a control series of 1,000 normal children from the same class and environment.

2. No psychometric investigation of children in this country on any reasonable scale at all.

3. No work done worthy of the adjective scientific on either the heredity factor or the environmental factor.

All that I could find was embraced in a few pedigrees and in general statements, such as we are all familiar with from asylums for the insane, namely, that so many relatives of the feeble-minded were insane or were alcoholic or were epileptic. It is needless to say that all such percentages of relatives affected are purely idle. What is the point of saying, for example, that 28 per cent. of the families of the insane or the feeble-minded show an alcoholic or a tuberculous history, when there is no further evidence to determine whether the alcoholism is due to the feeble-mindedness of the strain, or the feeble-mindedness to the alcoholism ? Is the feeble-mindedness due to the tubercular taint, or is the tuberculosis merely a feature of a generally degenerate stock, unable to resist any disease, mental or physical ; or again, are both merely the outcome of improper environment ? The percentages of family taint in the case of the insane as given in the asylum reports are perfectly worthless, and the same applies to the like returns for the feeble-minded. The most noteworthy and recent examples of such statements appear in the book on *Schwachbegabte Schulkinder*, by Professor Dr. Eugen Schlesinger, School Medical Officer in Strassburg, only published last year (1913).[1] In his second chapter, entitled ' Special

[1] *Schwachbegabte Schulkinder*, ihre körperliche und geistige Entwicklung u. s. w., Stuttgart, 1913. See also *Schwachbegabte Schulkinder*, Vorgeschichten und ärtztliche Befunde, Stuttgart, 1907.

Aetiology ', which I presume is intended as a study of causation, he tells us of several predisposing and aetiological factors in mental defect. He states that 21·6 per cent. of the next and nearer ascendants of the feeble-minded had severe mental defects such as paralysis, melancholia, epilepsy, and imbecility, while a further 27·6 per cent. suffered from slighter forms of mental weakness, neurasthenia, hysteria, moral imbecility, &c. Further, in 30 per cent. there was drinking in the parents to a greater or less extent, while among the parents of children in idiot asylums it has been found in 40 to 60 per cent. Let me remind you of what Edgar Poe said of himself : " My friends thought drink made me mad, I know that my madness drove me to drink " ; and you will grasp how useless are such percentages from the side of true aetiology, even if we are told, which we invariably are not, how many parents of normal children of the same social class also ' drink to a greater or less extent '. But having reached this weight of insane and drinking parentage, where would you expect to find the children of it ? Surely in the most undesirable environment, associated both with defective nourishment and with unsuitable dwelling and sleeping accommodation. What new knowledge do we gain when we are now told that 74 per cent. of the feeble-minded children come from bad, non-hygienic social surroundings ? What we require from the standpoint of aetiology is the separation of these conditions and the exact evaluation by modern statistical methods of their relative influence. I do not believe this can be done without careful collection and study of the pedigrees of perhaps a thousand mentally defective children. But until it is done no real work in the aetiology of feeble-mindedness will be possible. I have recently studied a great variety of medical text-books on the subject of the causation of mental defect, and I am prepared to say that there is not a single one in which the chapter on aetiology is worth the paper on which it is printed. The truth is that very few of these books have any real facts at all, and the authors of those few that have, have no idea of any scientific analysis.

I am not unconscious of the difficulty of collecting family histories. A generous anonymous donor placed a sum of £50 at my disposal to assist in the collection of the family histories of the feeble-minded. A home visitor was appointed and started work. Each family required, perhaps, two or three visits itself; there were additional visits to relatives, to poor-houses, infirmaries, asylums, and letters innumerable. By the time my £50 was exhausted and my visitor might be considered trained, we had 10 pedigrees complete and some 15 or 20 more in

progress. Looked at purely from the commercial standpoint every good pedigree involves an average expenditure of £2 to £3, and the least cost of adequate material in this case would be £600 to £1,000. It is urgent work, but work which no statistical laboratory like ours without adequate endowment can possibly undertake.[1] I do not blame the writers on feeble-mindedness for not having the requisite material, for I know what it costs to obtain it; but I do blame them for writing chapters on causation without adequate data from which to draw any conclusions at all.

That much feeble-mindedness is the result of heredity is absolutely certain. But *how much* is the question. Which types of cases are hereditary, and in what manner does descent take place? These fundamental questions are unanswered, or have only been answered in a manner totally unscientific. As I have said, it is almost appalling to put side by side the opinions of various authorities on feeble-mindedness.

Cornell finds that heredity is the most powerful and frequent cause of actual feeble-mind.

Schlesinger says that 52 per cent. of his cases are to be associated with malnutrition in the suckling period.

Lapage asserts that everything points to the conclusion that acquired causes have probably little effect in the causation or the determination of the ordinary or primary type of feeble-mindedness, though they may directly cause some of the special types. Primary feeble-mindedness is inherited and is a failure of development, the brain being irretrievably deformed owing to an inherited defect in the germ-plasm. It should be noted here that even when epileptics are included as a special class of the feeble-minded, about 87 to 90 per cent. of the feeble-minded fall under no special type: see Table, p. 21.

Seguin says that 25 to 30 per cent. of idiots and imbeciles come nearer and nearer to the standard of manhood, till some of them will defy the scrutiny of good judges when compared with ordinary young men and women.

Barr holds that the high-grade imbecile who is almost normal suffers from an absolute defect which can never be wholly supplied or restored.

Tredgold asserts that between the highest ament and the lowest normal an impassable gulf is fixed.

Others again hold that idiots, imbeciles, and the mentally defective differ not only qualitatively in their psychical characters from normals,

[1] The Galton Laboratory has, alas! no provision whatever for work of this kind, and yet much might be achieved on an annual income of a few hundred pounds.

but physically. They are, we are told, commonly undersized and dwarfish ; in 80 per cent. of cases they are asserted to present stigmata of degeneration—namely, malformations of the nose, mouth, eyes, ears, lines of the face, contours of the skull—in fact, all the stigmata which Lombroso found in his ideal criminal, or rather, in the type of man he asserted must be a criminal at heart, even if he committed no crime. In fact, there are two fundamentally divergent schools, one of which asserts that the mentally defective form, as it were, a differentiated species, and the other which proclaims that they are only an extreme variation of normal mentality.

Some of this opposition of opinion is clearly due to the difference between medical men who have worked in asylums for the idiot, and those who in the first place have come across the problem in the special classes of public primary schools. But we must here note that even among the 13·3 % of children rejected for the special schools, and therefore presumably of the asylum class, there are only about 5 per cent. (39·2 % of 13·3 %) of all examined who belong to special types : see Table, p. 21. In fact, about 87 per cent. of all mentally defective children examined are of no special type, and it is round this group of children that the gravest questions arise.

The American Eugenists, headed by Dr. Davenport of the Carnegie Station for Experimental Evolution, are special advocates of the view that the mental defectives are a completely differentiated race characterized by the absence of a Mendelian unit character which appears in the normal human being. The following is the opinion expressed by Dr. Davenport :

" It cannot be admitted that feeble-mindedness is a personal and private matter. There is reason for believing that it is one of the oldest traits of mankind—a heritage from his ape-like ancestry. The feeble-mindedness of to-day is (for the most part) the dower of a germ-plasm common to hundreds of thousands of kin living and past ; and if not controlled, that germ-plasm may pass into hundreds of thousands of descendants. How can the product of a germ-plasm with such a history regard his traits as purely personal and private ? " [1]

If this passage be capable of interpretation, it either means that in the man-like ape there was a character, a definite plus, which is absent in the man, or in man there is a definite plus which was absent in his ape-like ancestry. As the same American school looks upon feeble-mindedness as a Mendelian recessive, there is little doubt that

[1] *Journal of Psycho-Asthenics,* 1911, vol. xvi, p. 11.

it is the *absence* of some unit character to which Dr. Davenport is referring. "A character is recessive," we are told, "when owing to the lack of its determiner in the germ-plasm, it is not present in the individual under consideration."[1] And again, "the total inheritance of an individual from his parents is divisible into unit characters, each of which is inherited independently of all the rest,[2] and may therefore be studied without reference to other characters." "The inheritance of any such character is believed to be dependent upon the presence in the germ-plasm of a unit of substance called a determiner." Thus we conclude that the mentally defective on this scheme lack the determiner for normal mentality. Now the chief feature of the mentally defective is their incapability "of competing on equal terms with their normal fellows or managing themselves or their affairs with ordinary prudence". Their lack of will-power, their weakened memory, their incapacity for judging the relative value of stored sense-impressions create a hopeless gulf between them and the circumstances of the environment in which they have to persist, if they persist at all. That the ape is differentiated intellectually from the man goes without saying, but that the ape-like ancestry of man could have persisted for twenty-four hours in the hostile environment they would certainly have had to face had they been the least feeble-minded in the modern sense seems to me an absurd notion. I cannot conceive a feeble-minded ape—lacking for example in the strong social instincts —surviving at all in the struggle for existence. If you study the psychical characters of dogs, you will find that a feeble-minded dog is as possible as a feeble-minded man—but he is as differentiated from the normal dog as the feeble-minded man is from the normal man, and he would have no more capacity for surviving in a wild state than a feeble-minded child.

But this theory of the differentiated class has taken root and is leading to complete distortion of the perspective in regard to the mentally defective. It fits in so nicely with what we want to believe that it meets with ready acceptance. We assert that a certain subject is unfit to go unrestrained into our community. We legislate for his segregation without having any reasonable certainty as to how we are going to draw the line on one side of which he is supposed to lie.

[1] *Eugenics Record Office Bulletin* No. 3, p. 1.

[2] Dr. Davenport makes here a curious and probably quite unconscious criticism of those psycho-asthenic authorities who assert that mental defect is almost invariably accompanied by stigmata or physical defects.

How excellent it would be to assert that he really does differ from his normal fellows by the *lack of a determiner*! Surely there is an easy method of ascertaining whether such a definite factor is there or is not there! We can throw the burden of discovering it upon the shoulders of science.

The problem must press heavily at the present moment on our new Commissioners for the care of the feeble-minded, and it will be intensely interesting to see what they will make of it.

But observe how the moment we start a dogma of this kind, i.e. that there is a rigid line between the feeble-minded and the normal, and that there is lack of a unit-character in the feeble-minded, we slip into the most elaborate rules for ordering human conduct. We jump at once to the conclusion that all men consist of three classes, the normal-minded man who possesses the unit-character—the dominant of the Mendelian theory (DD)—, the feeble-minded man who lacks it—the recessive (RR) of that theory—, and the hybrid (DR) who possess feeble-mindedness as a *latent* character, which will reappear, if he mates with his like; otherwise the hybrid is not distinguishable from the normal-minded man. Hence we reach the advice given by the American School of Eugenics, "Weakness in any trait should marry strength in that trait," and again, "Let abnormals marry normals without trace of the defect, and let their normal offspring marry in turn into strong strains; thus the defect may never appear again. Normals from the defective strain may marry normals of normal ancestry; but must avoid consanguineous marriages." [1]

It is well that we should recognize what slender knowledge such statements, which the authors term 'eugenic rules', are based upon. In the first place, do these rules flow from Mendelian theory even if that theory applies, and secondly, on what evidence is the statement based that mental defect is a Mendelian recessive? The actual amount of mental defect in the community appears to be under 1 per cent., it has been estimated as something from $\frac{1}{3}$ per cent. to ·39 per cent. From this, if we assume for a moment that the Mendelian theory holds, and mental defect is a pure recessive, we can deduce the prevalence of latency. We find it to be 10·9 per cent. if the patent mental defect be $\frac{1}{3}$ per cent., and 11·7 per cent. if it be ·39 per cent.[2] We may

[1] *Heredity and Eugenics*, pp. 286, 288.

[2] In a *stable* population mating at random the formula is p^2 (DD)+2 pq (DR)+q^2 (RR), whence if q^2=·003333, we find q=·05773, and p=·94227. Thus p^2=·8879 and 2 pq=·1088 or 10·9 per cent. Similarly for q^2=·0039 q=·06245, p=·93755, p^2=·8789 and 2 pq=·1172, or 11·7 per cent.

anticipate therefore in the population at large 10 per cent. to 12 per cent. of latent amentia. The following table shows that slight differences in the estimates of patent amentia do not widely affect the extent of latency.

PERCENTAGES OF TAINTED STOCK ('LATENT AMENTIA') ON THE ASSUMPTION OF VARIOUS PERCENTAGES OF PATENT AMENTIA IN THE COMMUNITY

One Ament in	Percentage Patent Aments.	Percentage Latent Aments.	Percentage Non-Aments.
225 persons	0·44	12·44	87·12
256 ,,	0·39	11·72	87·89
289 ,,	0·35	11·07	88·58
300 ,,	0·33	10·72	88·79

Now let us investigate what happens, if for three generations the descendants of a feeble-minded woman and a normal man marry into absolutely normal stocks. In the first generation there would be 100 per cent. latent amentia; in the second generation there would be 50 per cent., in the third generation 25 per cent., and in the fourth generation 12·5 per cent. In other words, not till the *fourth* generation after the original mating would the latent amentia fall to anything like the percentage in the general population. Suppose for even three generations these tainted individuals had married into normal stocks and each marriage had led to four offspring, would Dr. Davenport then be correct in his inference? No, because 29 normal individuals who might if they had selected normal mates—as carefully as the feeble-minded stock have been supposed to select their normal mates—have produced progeny with a *zero* percentage of amentia, or, if they had mated at random, progeny with far less than the average percentage of amentia, have been employed to produce a tainted stock. This debit side of the process Dr. Davenport never refers to. But Dr. Davenport does not proceed to the third generation. He states that if the grandchildren of the feeble-minded woman refrained from marrying tainted stock their progeny would be *freer* than the population at large from taint and less liable to have marked offspring in random matings. In the case of the feeble-minded these grandchildren would have, at least, double the percentage of amentia in the general population, and—marrying at random with a general population of 0·39 patent aments, 11·72 latent aments, and 87·89 normals—would give in their progeny: 0·78 patent aments, 17·19 latent aments, 82·03 normals. In other words, there would be 100 per cent.

increase in patent feeble-mindedness, 25 per cent. increase in latent amentia—to say nothing of the wastage of 29 normal individuals who might have had *wholly normal offspring* by doing exactly what Dr. Davenport recommends the tainted stock to do, and thus have improved instead of worsened the mentality of the community at large. Such is the result of the ' eugenic rule ' of the Eugenics Record Office ! And to those of us who do not believe that the Mendelian law applies to mental defect, or that there is no risk of a normal who marries a feeble-minded woman having feeble-minded progeny, it is not merely 29 but 85 normal individuals whose progeny will, by such a practice, be tainted. Further, to attain even Dr. Davenport's results you must suppose that the working classes, who form the bulk of any population, have a knowledge of their own and their possible mates' great grandparents—a very rare occurrence, indeed, in our experience. They very often do not know when and of what disease their grandparents died. Surely a more effective and simpler eugenic rule for the people at large is : Do not marry a patent ament in the hope that your grandchildren can and will refrain from marrying individuals with latent amentia. Avoid the tainted offspring of aments, and marry only into healthy stock. If the aments cannot be segregated and must marry, let them marry their likes, so that the tainted stock may become manifest, and thus be shunned sexually by the mentally healthy section of the community. Personally I cannot conceive any rule more likely to discredit the whole science of eugenics than that put forward by Dr. Davenport. But Dr. Davenport continues as follows : " While the union of a normal man and a feeble-minded woman usually does not take the form of marriage, yet the case may well arise in the future, as it has arisen in the past, where a mentally vigorous man wishes to marry a socially attractive and beautiful, though defective, woman. Such a marriage may be from the standpoint of Eugenics, as from any social view-point, quite permissible." [1]

How any ' mentally vigorous man ' should find a mentally defective woman ' socially attractive ', and how a professor of the science of eugenics can find such a marriage permissible both from the social standpoint and from that of eugenics passes my comprehension. But what surprises me above all is, that when members of the Galton Laboratory point out the fallacy of such statements, and hold them up to the ridicule they deserve, they should be accused of doing

[1] *Eugenics Record Office Bulletin* No. 9, p. 12.

everything ignoble on the face of the earth, by those gentlemen who profess to be exponents of popular eugenics in this country. Yet here is the gravest social problem of the moment settled on the basis of the merest theory by the assertion that there is nothing from 'the social view-point' or from 'the standpoint of Eugenics to be objected to' in 'the mentally vigorous man' marrying 'the socially attractive' mentally deficient woman. I assert that so far from Dr. Heron having spoken too strongly, no words can be used too vigorous to ridicule such theory, or to condemn those in this country who are associating themselves with the propounders of eugenic doctrine of this type.

Thus far I have only endeavoured to show you that the Mendelian theory, if rightly applied to the problem of feeble-mindedness, does not lend itself even to the conclusions which are asserted to flow from it. But does the theory fit the facts even adduced as evidence for it by these writers themselves? Dr. Davenport has first to establish that when a *normal* individual marries a feeble-minded person the offspring are all normal. This might be considered an easy task by his method of procedure. For, wherever the offspring of a normal and a feeble-minded person are not all normal, he dismisses the normal individual—although he provides no evidence as to his ancestry—as tainted, or of abnormal stock. Actually in *Eugenics Record Office Bulletin* No. 1, there are *fifteen* matings in which one parent is normal and the other neuropathic (feeble-minded or alcoholic), and in all these cases the normal is not reported to have any affected relative. Dr. Davenport dismisses *thirteen* [1] cases in which the offspring are affected, and retains *two* in which they are not affected to prove the dominance of normality. These are his Cases II and III. Another individual, Davenport's Case I, is picked out of the *Eugenics Record Office* memoir on *The Hill Folk*, an admittedly tainted stock. It is hard to conceive a proof deduced by a more vicious circle of reasoning! Let us examine these three cases in succession for what they are worth, and judge the extent to which they demonstrate that the mentally vigorous man and the feeble-minded woman will have only normal offspring. Diagram I represents Dr. Davenport's Case I. He describes the little part he deals with to this effect: [2]

II. 7, a feeble-minded woman, married her father's first cousin (II. 6), who, though stubborn and disagreeable, is a good, intelligent workman. Of the two children, one (III. 8) is of quite normal intelligence and behaviour; the other (III. 9), though of good mental

[1] See my note, p. 51 below.

[2] *Eugenics Record Office Bulletin* No. 9, p. 9.

capacity, is mischievous and quarrelsome (like the father) and is always getting into trouble with other boys.

I have added a bit more of the pedigree which the reader of Dr. Davenport's words in *Bulletin* No. 9 would *not* have before him. From this it appears that II. 6, the father, is the son of a high-grade mentally defective woman, and thus on Mendelian theory itself ought to be a (DR)—a man with latent amentia—and not a normal (DD). Further, this same man on a second marriage with a woman, mental condition not recorded, had a high-grade feeble-minded daughter (III. 7), thus further demonstrating that her father (II. 6) could not have been a pure normal ! In fact, this man (II. 6) had 107 mentally defec-

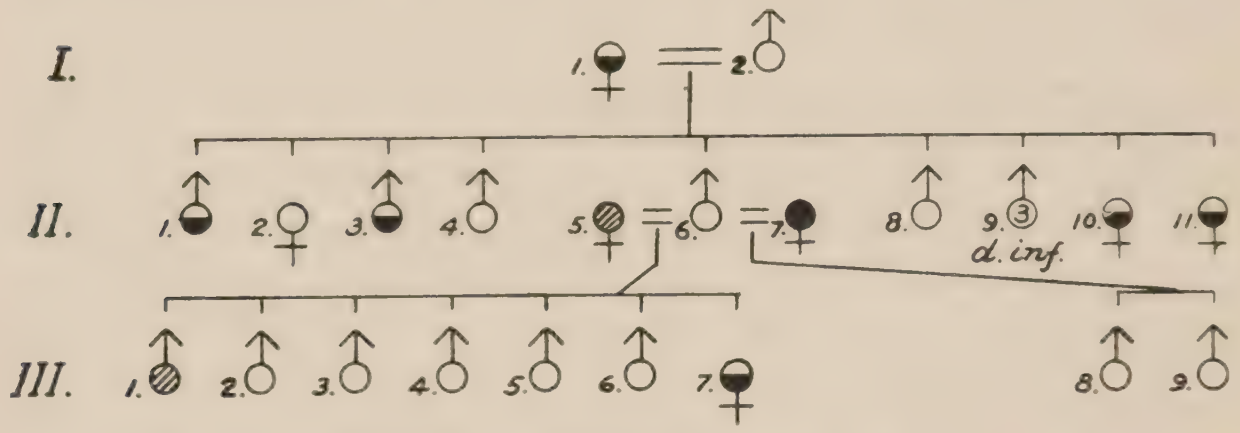


Diagram I. Davenport. The Hill Folk.

◒ = High Grade Mental Defectives, *such can support themselves in meagre way, but lack ambition, self-control, common sense, and ordinary mental or moral capacity to distinguish right and wrong.* ● = Low Grade Mental Defectives, *not capable of self-support.*

tive relatives, including his mother, two grandparents, three brothers, two sisters, three aunts, and one uncle, twenty-two first-cousins, &c. It is difficult to see how this illustration can bear on the 'eugenic rule' of a man of vigorous mental stock marrying a feeble-minded woman.

I now pass to Case II. I insert the full pedigree to illustrate how important it is to deal with the *whole* pedigree, when we wish to appreciate the value of the evidence with which Dr. Davenport supports his thesis.

This is Dr. Davenport's description : A feeble-minded woman (I. 2) married a normal man (I. 1) and had four children (II. 2–5), all normal except one (II. 2), who was alcoholic.[1]

Now if this case is to demonstrate the dominance of normality, we

[1] *Eugenics Record Office Bulletin* No. 9, p. 9. The case is taken from *Eugenics Record Office Bulletin* No. 1, p. 9.

must assert that the alcoholic son (II. 2) was mentally normal, or, at least, not feeble-minded. But the same feeble-minded woman (I. 2) in a second marriage with a normal but alcoholic man (I. 3) has now four feeble-minded children (II. 6–9). If this man were a pure normal this would be impossible ; if he were a latent ament the odds would be 15 to 1 against it. Elsewhere alcoholism is classed with feeble-mindedness, and this very case then used[1] as illustrating the ' rule ' that recessive mated with recessive gives all recessives or feeble-minded. But if so there is no justification for treating the other alcoholic man (II. 2) as normal. He marries a normal woman (II. 1) and has three normal and two mentally defective offspring. This well illustrates my point,

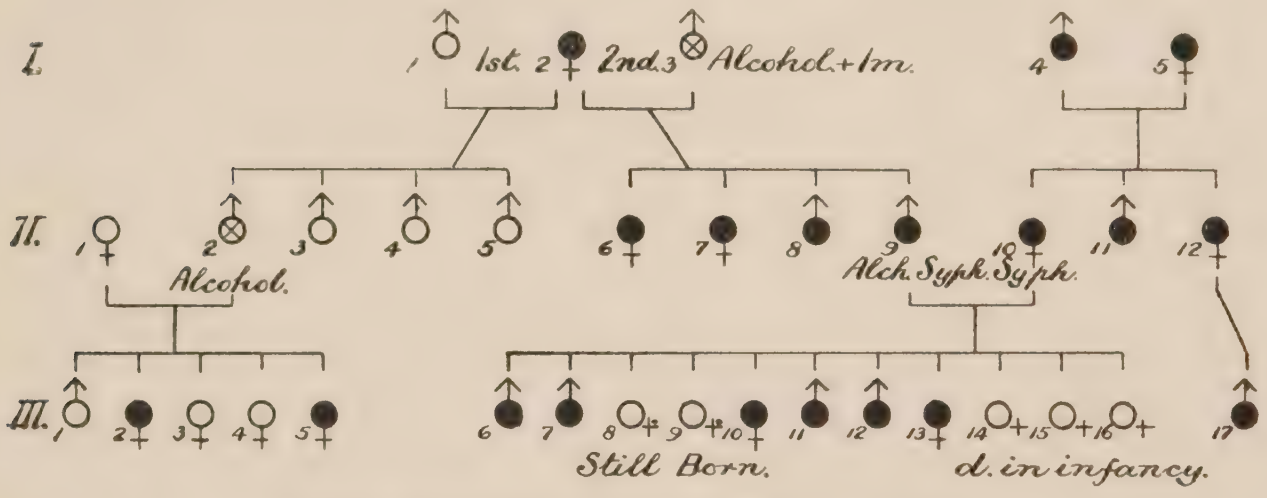


DIAGRAM II. Pedigree of Feeble-Minded. Goddard.

that the true rule is for every normal person, not only to avoid the ' socially attractive and beautiful ' but mentally defective mate, but to avoid marriage with any person, whose near ancestry shows mental defect. Considering the remarkable frequency of mental defect in this stock, I think the danger-sign should have been fairly conspicuous to II. 1 !

I now turn to Dr. Davenport's Case III, the full pedigree of which I illustrate in Diagram III.[2]

This case is described as follows—without any reproduction, be it remarked, of the full pedigree :

A ' degenerate ' man (I. 2), who was alcoholic and licentious, early married a ' normal ' woman (I. 1) and had two children, who are stated to be normal. By subsequent *feeble-minded* wives he had, however, children who were chiefly feeble-minded.

[1] Davenport : *Heredity and Eugenics*, p. 282, fig. 92.

[2] *Eugenics Record Office Bulletin* No. 9, p. 9. The full pedigree is given in *Bulletin* No. 1, p. 7.

Now either the alcoholic man is here to be conceived as a patent feeble-minded person, or as a latent ament, or as a pure normal. If he were a pure normal, he ought to have dominated his feeble-minded wives, and so had no feeble-minded children ; he has, however, five such children (II. 6–10). If he were a latent ament (DR), then he might have some normal children when mated with feeble-minded wives. Lastly, if he were a patent ament (RR), then he ought to have had only feeble-minded children when mated with feeble-minded women, but he has at least two normal children (II. 3 and 5). Thus he cannot be a patent ament, which is the only category he could belong to in order to illustrate the principle that a normal person mated to a feeble-

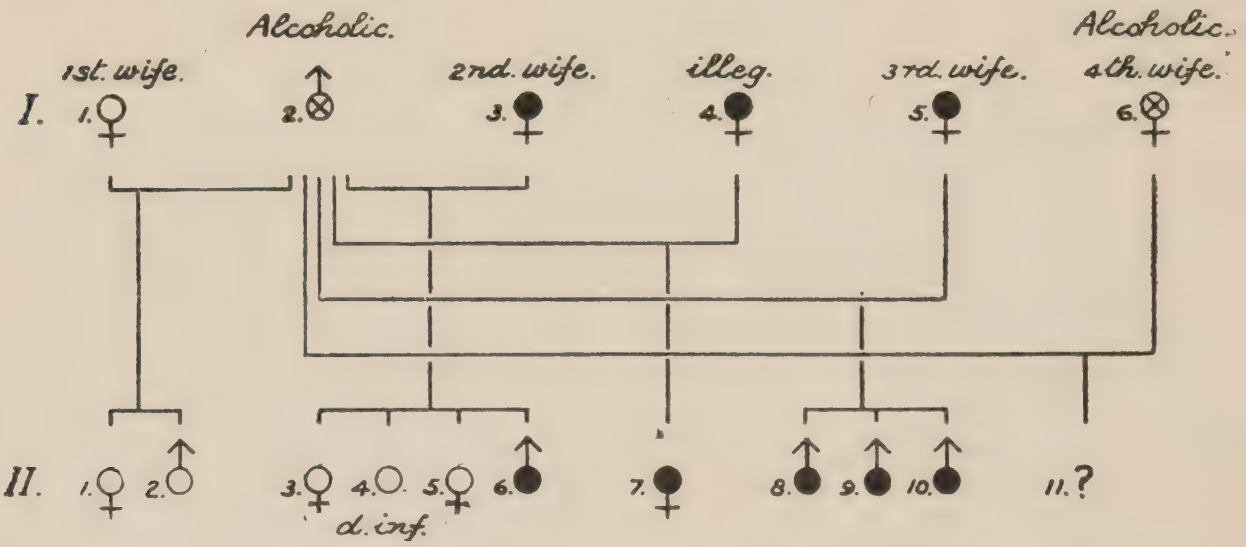


Diagram III. Part of Goddard's Pedigree, VIII A.

minded person will dominate the feeble-mindedness. If we go so far, however, as to assert here that alcoholism even with apparent mental normality is to be considered feeble-mindedness, what right have we in Diagram II to treat I. 3 or II. 2 as other than feeble-minded ? In which case the marriage in Diagram I of I. 1 and I. 2 cannot be taken to demonstrate the dominance of the normal mate over the feeble-minded. The fact is that alcoholism is by the American Mendelians treated as equivalent to normality, to latent amentia or to patent amentia just as may be needful to twist the facts to fit theory. In Diagram II, I. 3 is taken as a patent ament to explain the appearance of four feeble-minded offspring, but II. 2 is classed as a normal, to justify the dominance of normality. In Diagram III, I. 2 is a patent ament in his first mating to emphasize the safety of a normal marrying an ament, but he is a latent ament to account for the appearance of normal children in his second mating ; while the odds being 15 to 1

that he is not a latent ament in respect of his children II. 7–10, he will probably be again a patent ament to explain the results of his matings with I. 4 and I. 5 !

Even at the risk of producing weariness, I must pursue this subject a little further. The chance of a latent ament is about 1 in 8 or 9, let us give it the greater probability, or 1 in 8. Now it is the custom of the American Mendelians when they come across a normal person, who on mating with an affected person has affected offspring, to assert that the normal person is latently affected. We are here assuming that the affection is, like feeble-mindedness, asserted to be a recessive character.

The chance that a marriage of a patently affected person with an apparently normal person is really with a latently affected individual being 1 in 8 we have the following system of odds :

Against 1 such marriage occurring in a pedigree	7 to 1
Against 2 such marriages occurring in a pedigree	63 to 1
„ 3 „ „ „ „	511 to 1
„ 4 „ „ „ „	4,095 to 1
„ 5 „ „ „ „	32,767 to 1
„ 6 „ „ „ „	262,143 to 1
„ 7 „ „ „ „	2,097,151 to 1

Now examine the following pedigree due to Miss Mary Dendy and published by Lapage :

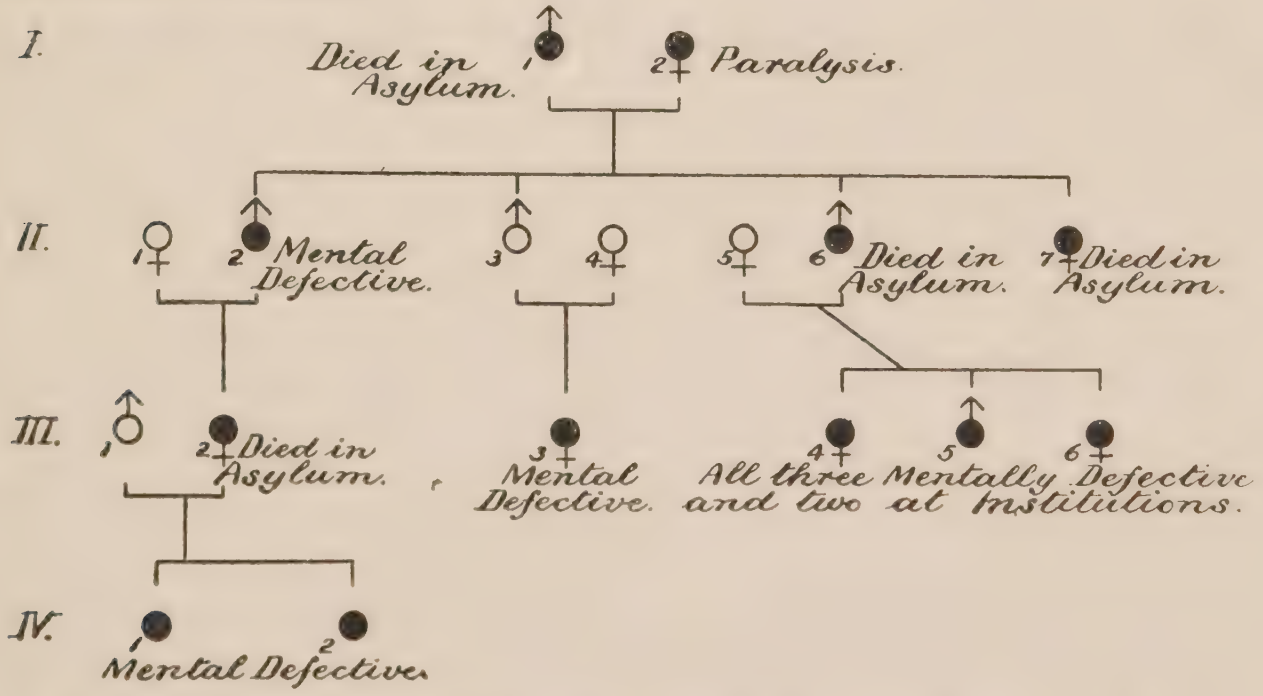


DIAGRAM IV. From C. P. Lapage. Feeble-mindedness in Children of Schoo Age.

It is a most typical and excellent pedigree. Unfortunately, although I have inquired both of Dr. Lapage and Miss Dendy, it is not possible

now to determine the nature of the 'paralysis' of I. 2. Suppose her first to be a 'recessive' or patent ament, then she ought not to have had the normal child II. 3. Now if we suppose her to have been an apparent normal, then the following individuals in this pedigree, I. 2, II. 1, II. 4, II. 5, and III. 1, although *apparently* normal, must all be treated as latent aments, and the odds against this by the above table are 32,767 to 1! Such odds might be somewhat reduced by assortative mating, but we must remember that on Mendelian theory there is no outward sign to differentiate the normal and the latent amental stocks. and thus no conspicuous selection character is available.

Diagram V, from the Department of Public Health and Charities

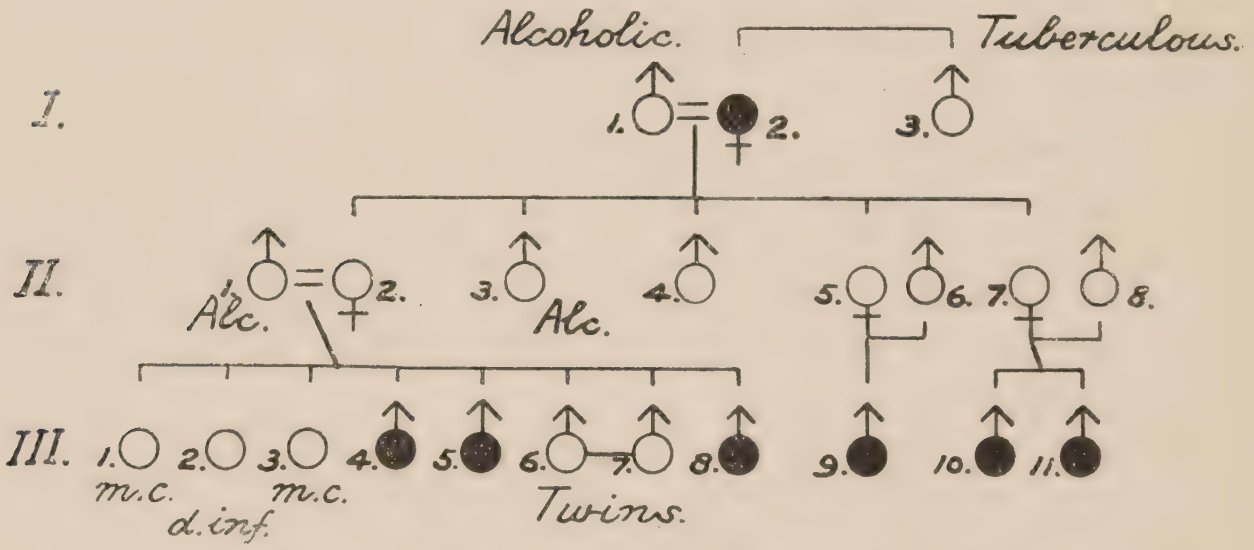


Diagram V. (*Bull. Pub. Health, Philadelphia, U.S.A.*)

of Philadelphia,[1] shows that the known alcoholist II. 1, together with the unknown mates of II. 5 and II. 7, must all have had, at least, latent amentia. The odds against this are 511 to 1.

In a number of other cases in the same paper the odds due to marriages of apparent normals producing feeble-minded children are of similar order. I have numerous pedigrees in my possession showing 3, 4, or 5 marriages with apparent normals resulting in feeble-minded offspring, and thus giving odds of 511 to 1, 4,095 to 1, or 32,767 to 1 against these individuals being latent aments. Perhaps the most interesting pedigrees in this respect are due to Dr. Tredgold, who actually selected cases in which one ancestral stock was very healthy and had no history of mental defect to trace what really happens on mating with feeble-minded stocks. The accompanying diagrams illustrate

[1] *The Transmission of Feeble Mind. Bulletin* No. 3. By Joseph S. Nebb, M.D.

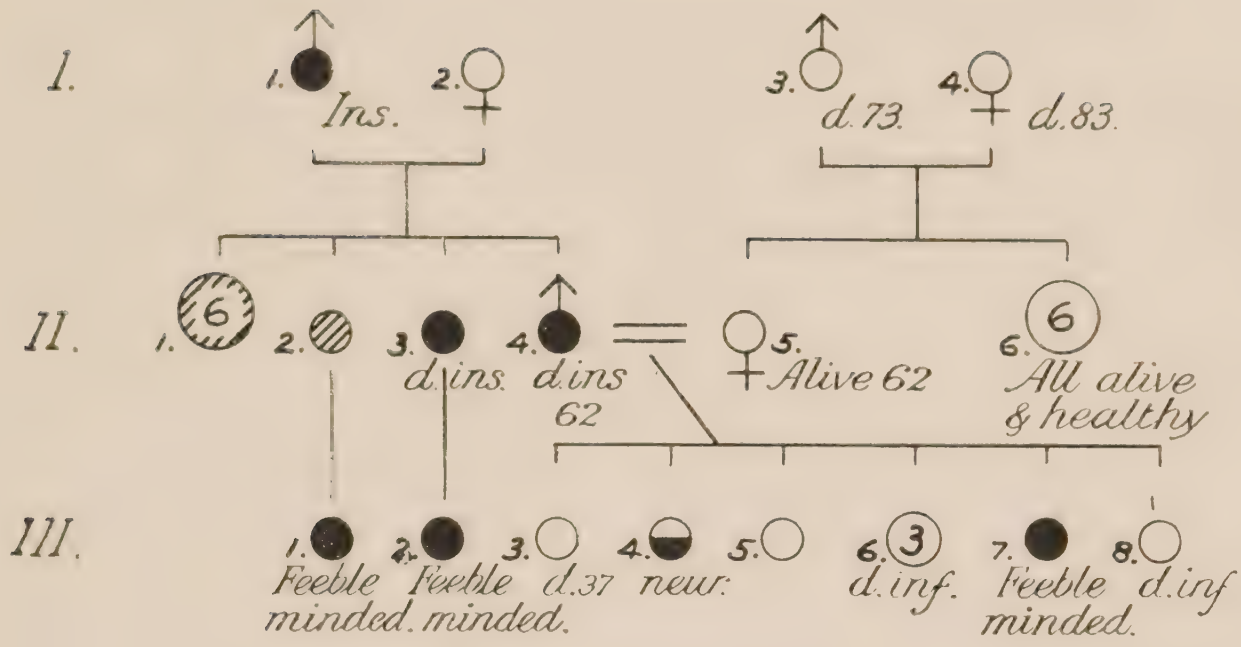
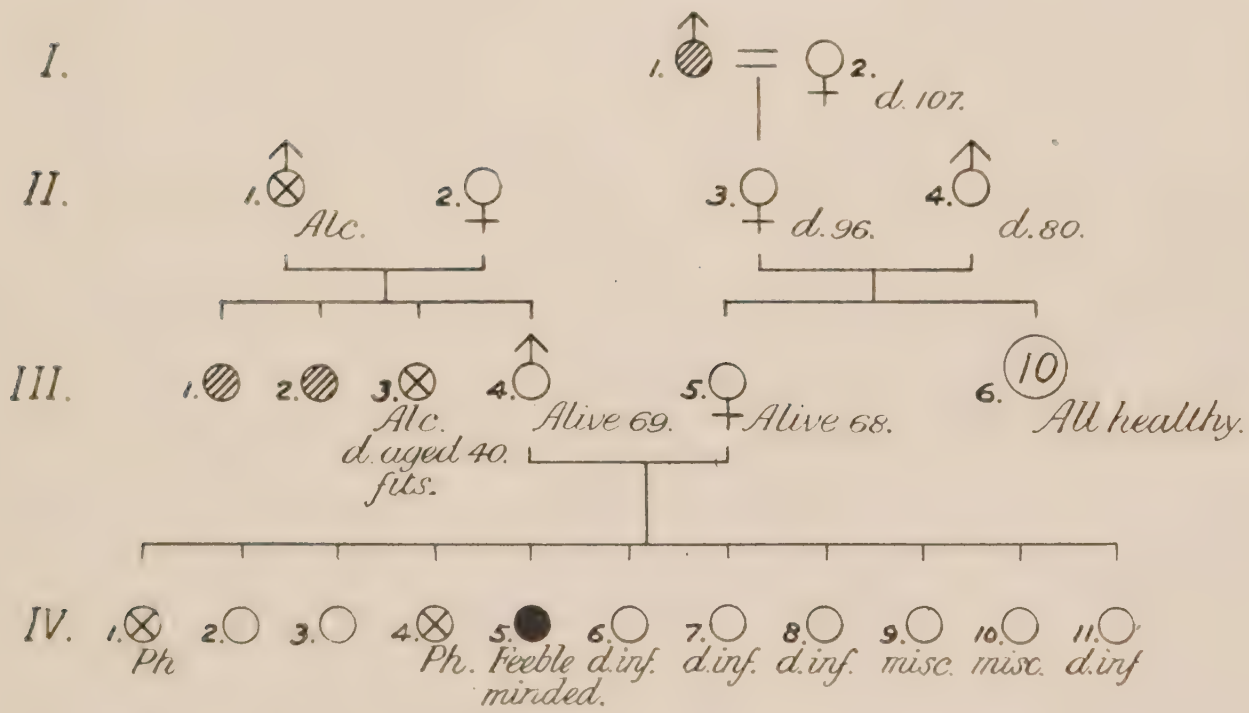


DIAGRAM VI. Tredgold's Case.



... Nothing known.

DIAGRAM VII. Tredgold's Case.

two of Dr. Tredgold's cases, which might indeed be indefinitely supplemented by cases showing instances of mental defect arising when a normal stock has mated with a degenerate stock. In the first of Dr. Tredgold's cases there are four cases in which an apparent normal must have been a latent ament, or the odds against such a pedigree are 4,095 to 1. In the second of Dr. Tredgold's cases we have feeble-mindedness resulting from the inter-marriage with a degenerate, not necessarily feeble-minded stock. I think that the only safe eugenic rule is to eschew matrimony with all degenerate stocks, and not risk the taint of amentia by putting our faith in Mendelian theory.

It is not needful at present to pursue this subject further.[1] What I have indicated seems to me to show a treatment exhibiting nescience, not science. I would only add that while we are absolutely certain that feeble-mindedness runs largely in definite stocks, and is more or less interchangeable with alcoholism, insanity and epilepsy, we have not yet enough material wherein mental defect has been classified and carefully measured to be certain of its actual method of descent. Nothing that is really known on the hereditary side of feeble-mindedness at all justifies the view that it is differentiated from normal-mindedness by the absence of any Mendelian unit from the germ-plasm. Those who believe that some principle of heredity will aid them in demonstrating the discontinuity of feeble-mindedness and normal-mindedness have still a long way to travel in the way of actual record and research.

I now turn to the problem of whether we can differentiate the feeble-minded from the normal by any marked physical signs.

Dr. Barr tells us that 'Feeble-mindedness, including idiocy and imbecility, is a defect either mental or moral or both usually associated with some physical stigmata of degeneration'. Now there seems little doubt that physical differentiation may be noted in specific types of idiocy such as the Mongol or the microcephalic. But as I have already indicated, about 90 per cent. of the children examined for admission to the special schools are of no special type. The table below illustrates this :

[1] I do not enter now on cases where two feeble-minded persons produce one or more normal offspring. Even Dr. Davenport has found such exceptions to Mendelian rules, and they can easily be multiplied, but they can be equally easily evaded by suggesting that the feeble-mindedness was in the case of one or other parent acquired, or that the offspring had not been sufficiently carefully observed, or that they were not due to their reputed parents, &c. When a theory is elastic, in that it demands no numerical evaluation of a character, there is usually small difficulty in treating the material also as plastic.

DISTRIBUTION OF 904 CASES EXAMINED FOR ADMISSION TO MANCHESTER SPECIAL SCHOOLS (LAPAGE)

FEEBLE MINDED

	Rejected as too Defective 120 = 13·3 %.	Admitted 784 = 86·7 %.
Cretins	2 = 1·7 %	6 = 0·8 %
Mongols	7 = 5·8 %	4 = 0·5 %
Microcephalics	0 = 0·0 %	5 = 0·6 %
Paralytics	10 = 8·4 %	9 = 1·1 %
Hydrocephalics	3 = 2·5 %	2 = 0·3 %
Of no Special Type	74 = 60·8 %	716 = 91·3 %
Epileptics	24 = 20·8 %	42 = 5·4 %

91·3 % of children admitted, 87·4 % of all children examined, were of no special type.

Now I will put slowly before you collections of children from low social grades. [The lecturer threw on the screen a large number of photographs; for examples, see frontispiece.] Some of the groups are feeble-minded, some are normal, some are mixed. I do not believe that even the experienced school medical officer could possibly pick out, without talking to the individual children, the mentally defective by physical signs only. I remember once looking with a distinguished authority through a long series of photographs of mentally defective children, and being told how striking the stigmata were. I could find nothing as long as we kept away from the 'special types', that I had not seen in low class normal-minded children, and I said so. "Ah, but you cannot see on the photographs the remarkable palates of most of these children!" I said: "Have you *measured* the palates of these children and of a hundred or so normal children?" The answer was: "No, but a quite obvious and remarkable differentiation of the palate exists." Within a year of that conversation two American investigators, Channing and Wissler, had taken casts of the mouth of 300 normal and 300 mentally defective children. They concluded after very careful measurements that "the absolute size of the palate as measured by three specified dimensions, seems to be the same for feeble-minded as for normal individuals".[1] Quite recently the retina of several hundred imbeciles was examined for me ophthalmoscopically, and with the same result: there was no sensible difference between the feeble-minded and the normal child.[2]

[1] *American Journal of Insanity*, lxi, 695, 1905.

[2] It has been asserted that the retina of imbeciles is more often abnormally pigmented than in the case of normals.

I shall believe in stigmata for the mentally defective child, when there has been a really scientific study of the subject, till then we may place them in the same category as the stigmata which Lombroso asserted existed in the criminal, but which Dr. Goring has so effectively demonstrated to have no existence in the case of the English convict.[1]

The usual demonstration of the physical inferiority of the mentally defective child is very superficial. A few measurements are made on the mentally defective children of one district and compared with those for the same characters in a different district, or for the whole of England. This is extremely unsatisfactory. Thus Lapage compares Manchester mentally defectives with Aberdeen and Edinburgh school children, forgetting how superior these Scottish children are in weight and height to the English, and especially to the small Lancashire type.

Lapage's results are not adequate ; he has examined only 58 girls and 123 boys, and clubbed them together in age-groups of 6–9, 9–12, 12–15, and we cannot be at all certain with such small numbers that the age-groups will have mean values of 7·5, 10·5, and 13·5 years. But clearly we must seek in Manchester itself for equivalent data. The social class should be much the same, and the feeding should be similar, i.e. as the feeble-minded children are institution children we ought to take, if possible, institution children. The most suitable comparative data I have been able to find for Dr. Lapage's material are the heights and weights of Manchester Industrial School children. Now if you examine the resulting data (see p. 23) you will find no difference in the stature of boys ; feeble-minded girls of the younger ages seem taller and heavier, but of the older ages slightly shorter and lighter. If, however, we note that there were only 15 of them, there is no certainty that the average of these 15 girls was 13·5 years, where alone we can put them. Six months' difference in the average ages of the groups would account for this. The weight curves look to me as if Dr. Lapage had weighed his children without boots ; the Industrial School children were weighed with boots. The material is, however, far too slender to base any scientific result upon at all.

Somewhat better comparative material is provided by Dr. Norsworthy, who came, it seems to me, with the unprejudiced mind of a psychologist to the material.[2] She compared about 150 mentally defective children with 300 normal children, and her method of

[1] *The English Convict*, 1913, published by Wyman & Co.

[2] *The Psychology of Mentally Defective Children.* By Naomi Norsworthy. *Archives of Psychology*, No. 1, November 1906.

making the comparison was statistically adequate, which is more than can be said of most of the material I have seen. She took the deviation of each defective from the mean normal character of its age and

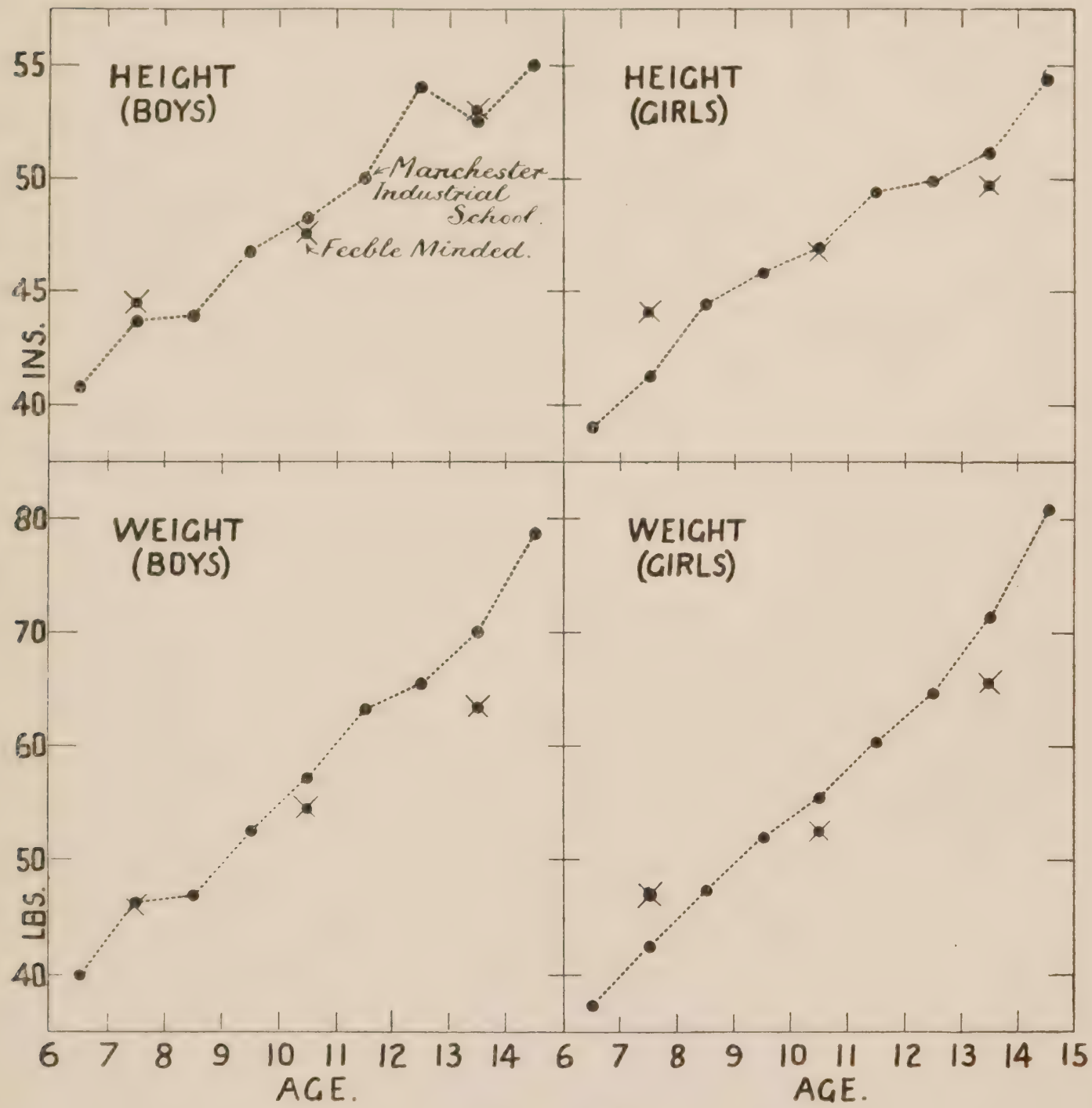


DIAGRAM VIII.

divided that deviation by the quartile or probable deviation of the normal children of that age. She was thus able to put all her defectives into a single group without regard to age. But a considerable section of her children were *institution children*, and therefore of a higher grade of deficiency than if they had been entirely 'special school'

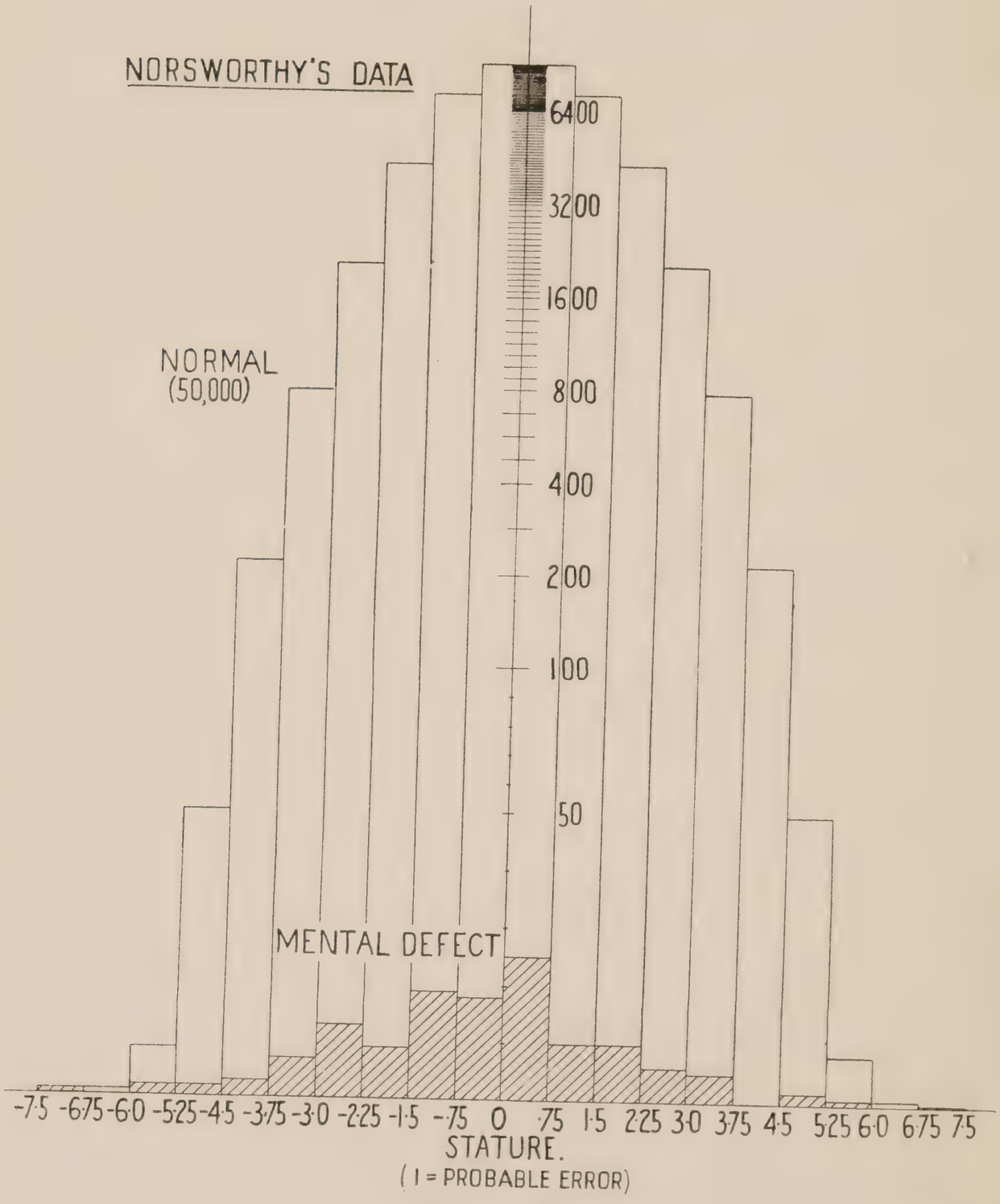

NORSWORTHY'S DATA
6400
3200
1600
800
400
200
100
50
NORMAL
(50,000)
MENTAL DEFECT
-7·5 -6·75 -6·0 -5·25 -4·5 -3·75 -3·0 -2·25 -1·5 -·75 0 ·75 1·5 2·25 3·0 3·75 4·5 5·25 6·0 6·75 7·5
STATURE.
(1 = PROBABLE ERROR)

Diagram IX.

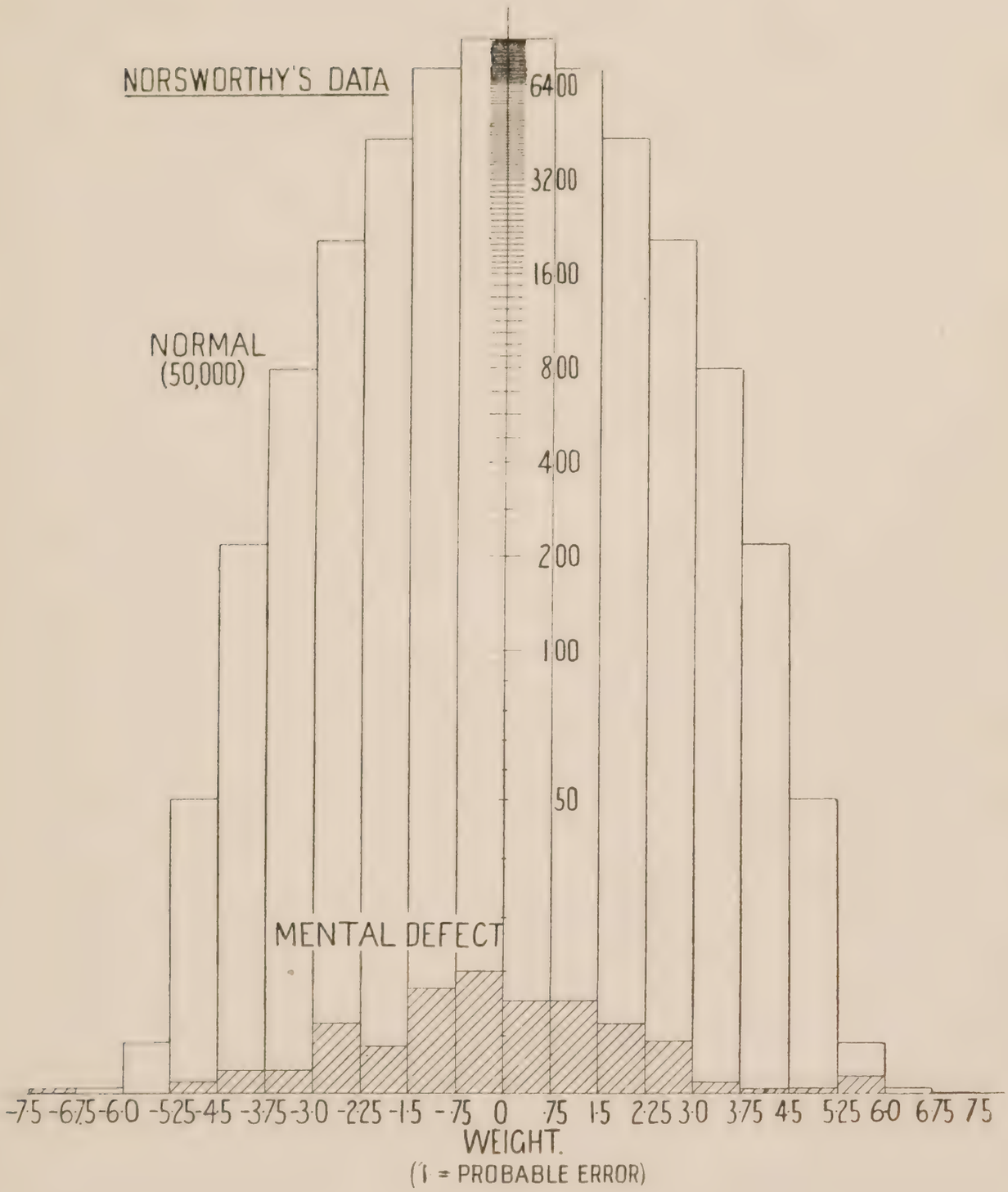

NORSWORTHY'S DATA
NORMAL
(50,000)
MENTAL DEFECT
6400
3200
1600
800
400
200
100
50
-7·5 -6·75 -6·0 -5·25 -4·5 -3·75 -3·0 -2·25 -1·5 -·75 0 ·75 1·5 2·25 3·0 3·75 4·5 5·25 6·0 6·75 7·5
WEIGHT.
(1 = PROBABLE ERROR)

DIAGRAM X.

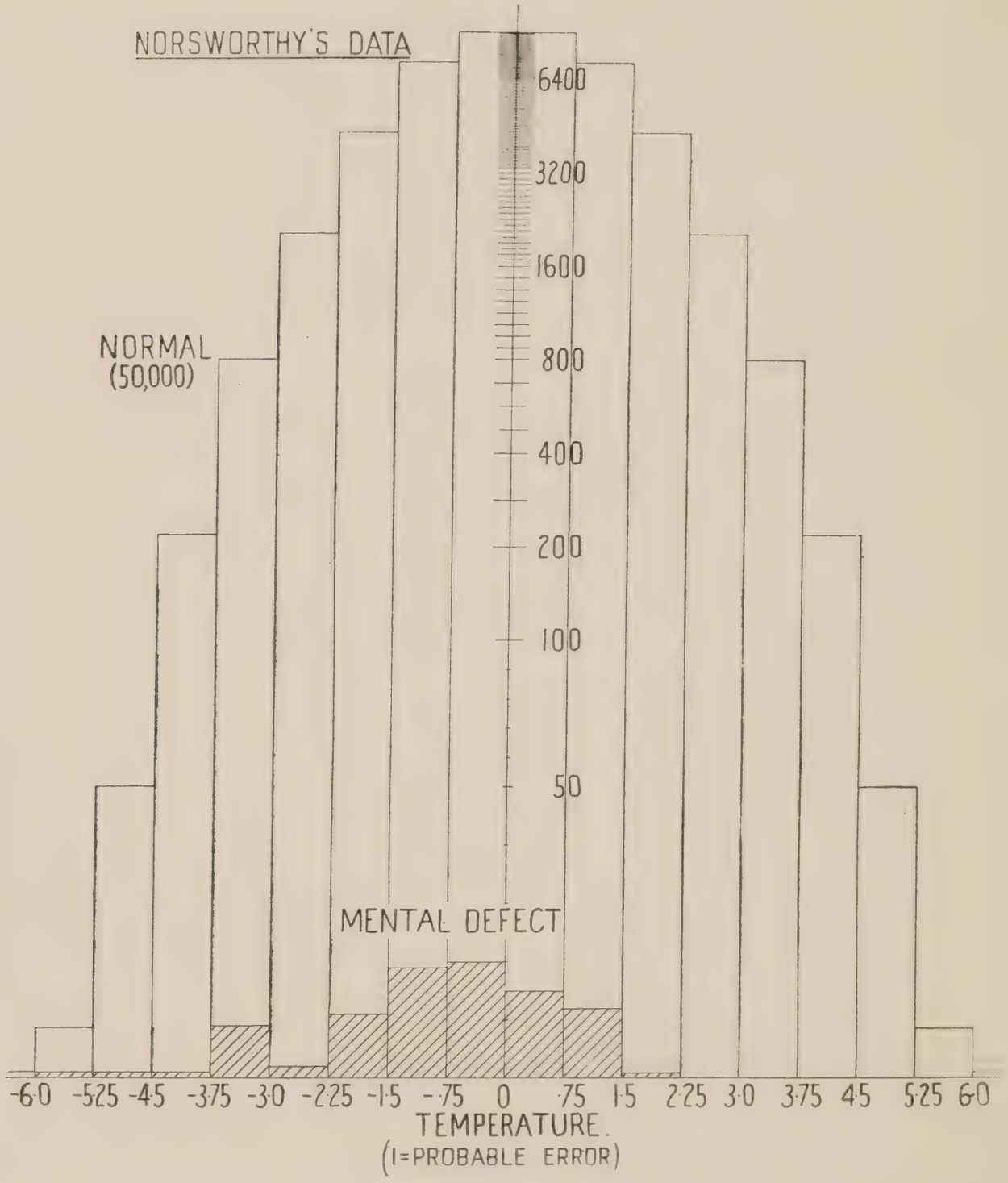

NORSWORTHY'S DATA
6400
3200
1600
NORMAL
(50,000)
800
400
200
100
50
MENTAL DEFECT
-6·0 -5·25 -4·5 -3·75 -3·0 -2·25 -1·5 -·75 0 ·75 1·5 2·25 3·0 3·75 4·5 5·25 6·0
TEMPERATURE.
(1=PROBABLE ERROR)

Diagram XI.

children. I have supposed her selection to have been made out of 50,000 normal children, or her feeble-minded to be about 0·3 per cent. for these physical characters. But, unfortunately, you cannot show 50,000 children on the same diagram with 150, without modifying the scale, and this my colleague, Mr. Soper, has ingeniously achieved for me (see p. 24). The middle ordinate represents 9,676 children. You see that with the possible exception of one dwarf the whole of the feeble-minded might have been selected out of the normal children; they are not, of course, a random selection, but for every defective child there will be found normal children with like stature, and the same remark applies to weight. Both height and weight distributions for the mentally defective centre round the same points as for the normal.

Norsworthy also took the oral temperature of her mentally defectives, and I show you her results based on the same plan (see p. 26). Clearly, temperature of the individual would not serve as means of differentiating the mentally defective, but if Norsworthy's results are correct, the average temperature is lower for the mentally defective than for the normal. This view is apparently supported by the opinion several times expressed in the text-books, that the temperature of idiots is lower than that of normals. To support her view that temperature decreases as mental ability decreases, Norsworthy took the first four series in the table below:

TEMPERATURE AND MENTAL POWER

Observer.	Class.	No.	Length of oral insertion.		
			2 mins.	5 mins.	10 mins.
Norsworthy	Brightest girls in 3rd and 4th year classes	20	99·2	?	?
,,	Ordinary girls in ,, ,,	31	98·4	?	?
,,	Mental defectives	38	98·3	?	?
,,	Idiots	55	97·4	?	?
Pearson	Winchester College 'Men'	300	—	—	98·4
Goring	Normal criminals	400	—	98·3	[98·6]
,,	Feeble-minded criminals	100	—	98·6	[98·9]

The difference between 5 minutes and 10 minutes insertion with a Kew registered '½ minute thermometer' inserted orally, and with proper precaution for the mouth being kept closed, is about 0·3° to 0·4° F.

But when I found she only kept the thermometer in the mouth for *two minutes*, I felt doubtful of the value of her results.[1] Through the courtesy of Dr. Charles Goring I was able to obtain the temperature

[1] Great care is needful in the temperature-taking, especially as the mentally defective probably contain a sensibly greater number of mouth-breathers.

of 400 normal and 100 mentally defective criminals, and against these I put the temperature of 300 Winchester College 'Men'. See Table, p. 27. Here, if anything, the mentally defective have the higher temperature, and this is shown by the actual data to be true at every age separately. I conclude, therefore, that a temperature differentiation of the mentally defective is not established. If there be, not for the individual, but for the mass, slight physical inferiority in the mentally defective children, I believe this would be equally found in the normal members of the same families; it is not the product of mental defect, but due to the fact that mental defectives are drawn in the bulk of cases from enfeebled and degenerate families. We have to remember that testing 376 children at Vineland with tuberculin vaccination on the arm Cornell found 36 per cent. showed a + reaction, while further the Wassermann reaction was + in 21 per cent. of cases. Bad physique need not be a necessary association of feeble-mindedness under such conditions; and it is remarkable how little sign really exists of physical differentiation. Before the association of general physique and mental defect can be properly measured, we should have to compare the physique of the normal brothers and sisters of the feeble-minded, i.e. persons of the same class and home environment, with that of the feeble-minded themselves. Until this is done, little definite weight must be given to statements that there is a necessary association between feeble-mindedness and physical inferiority.

We now come to the all-important question of *mental* differentiation, on which the problem of distinguishing the mentally defective must really turn. Here, again, I think a great deal of the diversity of medical opinion arises from the fact that some medical men start with the experience of extreme asylum cases, the 2 or 3 per cent. of special types of idiot and imbecile, and others with the school experience of the 90 and more per cent., who first trouble the educational world as school inefficients and who ultimately trouble the community as social inefficients.

Now this is the point I want to insist upon: we are dealing in the first place with a very great mass of school inefficiency, with children who can make no school progress; who are apathetic; who are stubborn; who have no sense of moral or of social order; or, again, with children, who may be moral, interested, easy to rule, but who are incapable of all mental progress—or of progress at all compatible with work alongside normal children. Now you will notice here a whole range

of mental and moral characters thrust under one heading, that of 'mental defect', and it is assumed, when we speak of 'mental defect' as a Mendelian recessive, that all these various phases of mind and temperament can be included under a single mental 'determiner'!

Here, again, the utmost diversity exists among authorities. Dr. Goddard writes:

"The notion that a child may be born with his natural faculties all right and his moral faculties all wrong is a notion that belongs to the Middle Ages of Sociology and Ethics as well." [1]

He contradicts himself, it is true, within a couple of pages by saying: "I believe that imbecility may be hereditary, but the moral part is a question of environment." [1]

On the other hand, Miss H. V. Bruce, of the New York State Training School, holds that the morally deficient are not necessarily mental deficients—a conclusion which a good many of us would be prepared to accept. The usual argument on the other side is that breaches of the moral or social code involve a want of self-control, and that self-control is a *mental factor*. This is perfectly true, but I fancy perfectly idle, for the question may turn on the strength of the instinct that has to be controlled. As I fail entirely to appreciate the view that all men are equal in reasoning power and in will-power, so I cannot but suppose that they have every grade of animal passion and every grade of social instinct. I don't believe that I am not an alcoholist owing to my exceeding strength of self-control. I can conceive that many lovers of alcohol have as great will-power as I have, but they fail because their instinct to alcohol is far in excess of mine. The same remark applies to thieving and to sexual offence in the so-called feeble-minded. A little study of animals, especially of dogs, would suffice to convince writers on the feeble-minded, that lack of self-control is not the sole factor that has to be judged, but the intensity of the primary instincts has also to be measured and appreciated, before we can class moral imbeciles as mentally defective. It appears to me, that the term mental defective ought to be replaced by some such term as 'social inefficient'. We are dealing with a class—at first recognized as 'school inefficients', because they cannot take their place in the ordinary school community—who develop into 'social inefficients'. They are not necessarily mental deficients at all; they may have defective reasoning power, they may have defective will control, but they may equally well have abnormal instincts; and one

[1] *Journal of Psycho-Asthenics*, xiv. 37, 38.

or other of these factors renders them incapable of taking their part in the common life of the community. As long as we stick to the general principle that we are dealing solely with *mental* deficients, we shall fail to reach clearness in our treatment of the problem of the so-called feeble-minded. We have to see that we are really on the fringe of the biggest problem of the modern state—the question of social inefficiency. How are we to discover *a priori* from among the school inefficients the social inefficients of adult life ?

Now it is needful for me to justify first this statement, that on the basis of mental power there is no means of differentiating the so-called mentally defective from some one or other normal child. I first approached this problem with some confidence in the teacher's judgment and small belief in the tests of the professional psychologist. The result of a study of old and new material convinces me that the psychologist in this matter is a factor as important as either the teacher or the medical man. It is easy to pick faults in the psychological tests, but taken as a whole I am convinced that they form a most valuable new instrument of research into this difficult problem. I will put before you two sets of investigations into feeble-minded and normal children; the first set covers about 100 to 150 feeble-minded and 250 to 900 normal children, according to the individual test; these are due, again, to Dr. Norsworthy.[1] She uses precisely the same manner of exhibiting her results, as I have discussed before; namely, she expresses the deviation of any given defective child from the mean of the normal children of like age in terms of the probable deviation of the same normal children. She is thus able to classify all her children together. She uses eleven tests designed to test: memory of related and of unrelated ideas, ability to form abstract ideas, ability to appreciate relationships, sensitivity and motor control. It seems to me that her series is a good one. She sums up in three classes, (1) *Intelligence Tests*, (2) *Memory Tests*, and (3) *Maturity Tests*, under the latter term including tests for efficiency of perception, and perception of different weights. I put her results before you, in the same form as we have handled the weight and stature tests of the same children. I ought to state that I am alone responsible for this method of exhibition, but I think it appropriate.

We look first at *Memory*, and see (p. 31) that the distribution of the ' mentally defective ' is absolutely continuous, and that if we took

[1] *The Psychology of Mentally Deficient Children.* By Naomi Norsworthy, Ph.D. *Archives of Psychology,* No. 1, November 1906.

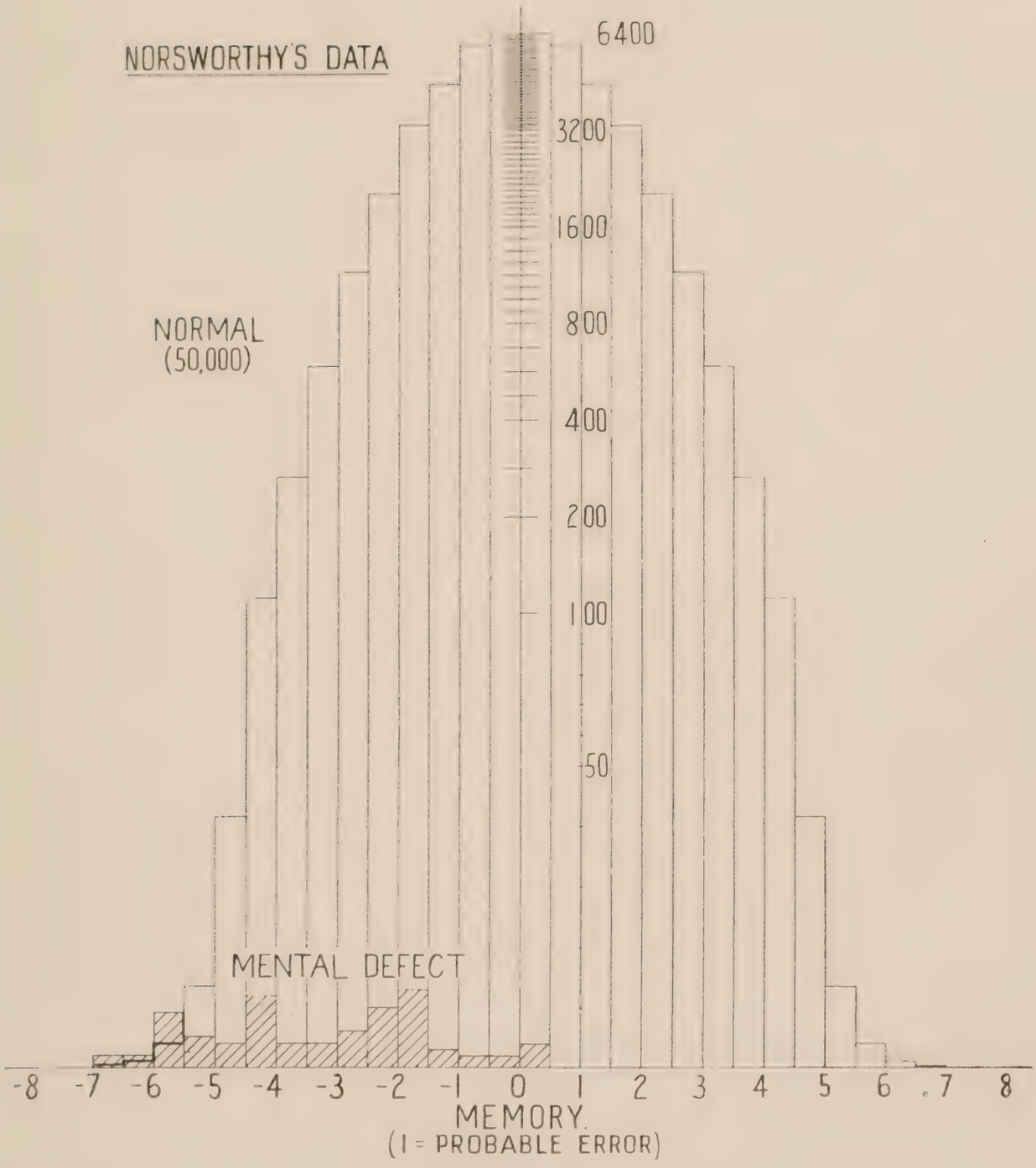

NORSWORTHY'S DATA
NORMAL
(50,000)
MENTAL DEFECT
6400
3200
1600
800
400
200
100
50
-8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8
MEMORY.
(1 = PROBABLE ERROR)

DIAGRAM XII.

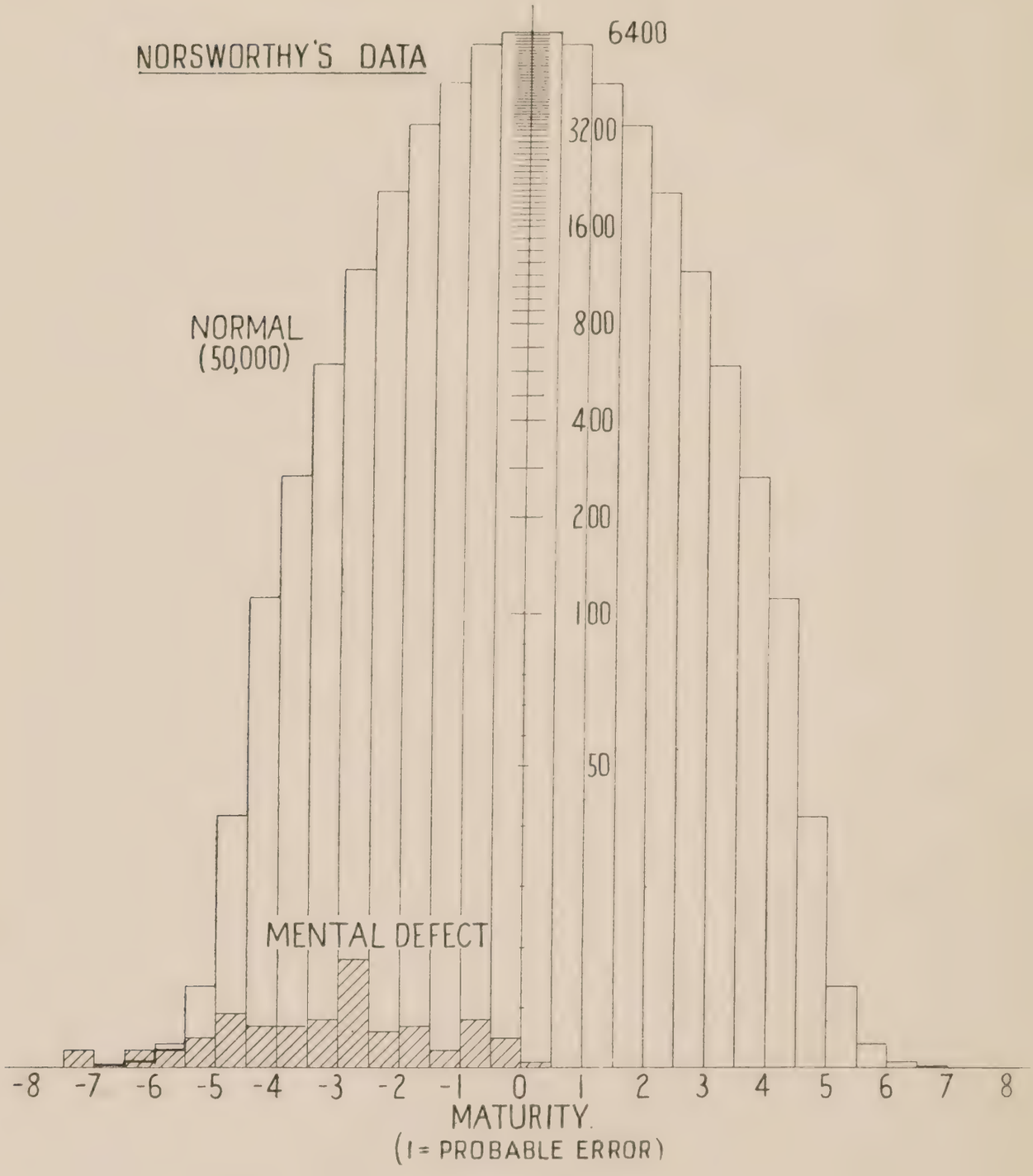


Diagram XIII.

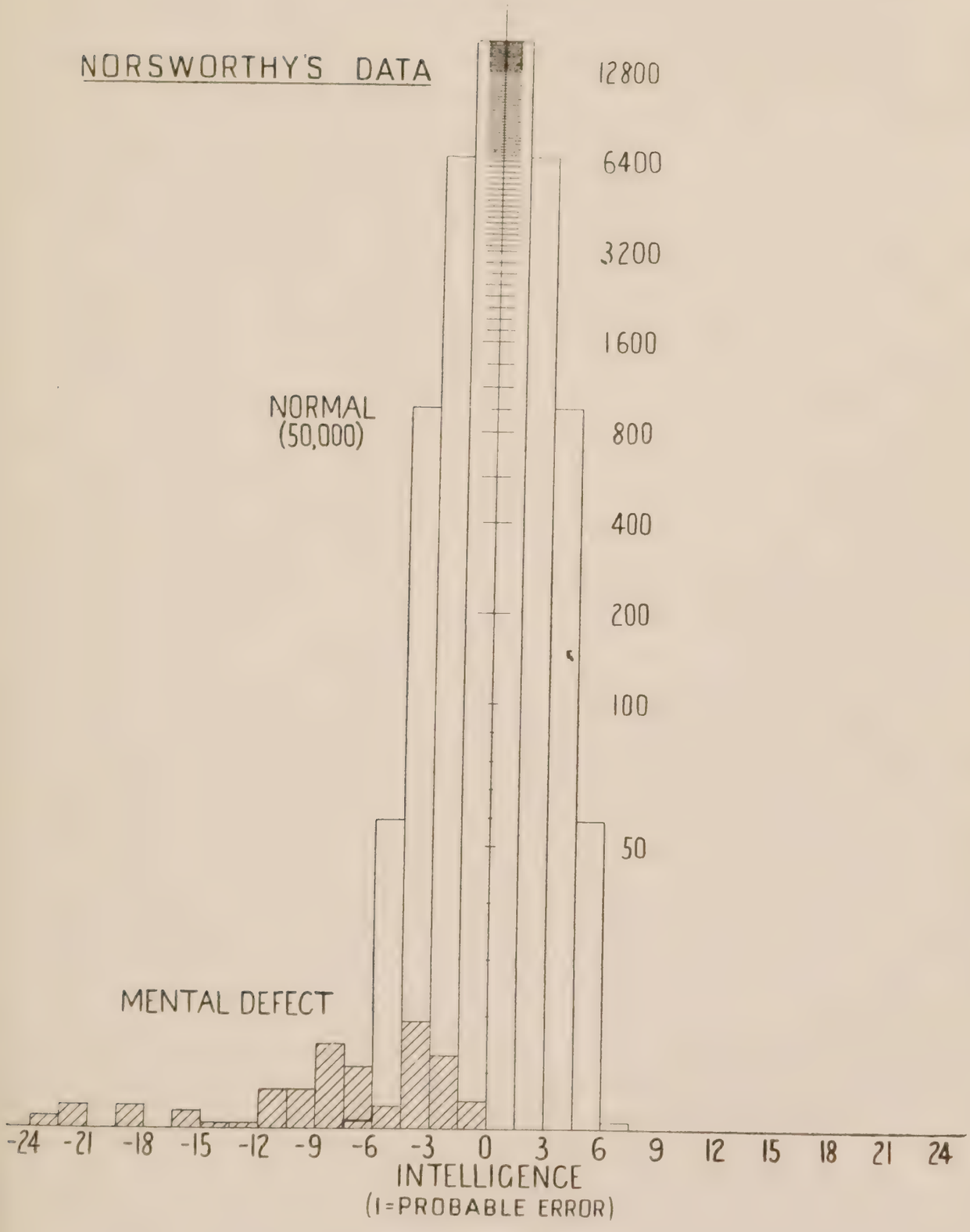

NORSWORTHY'S DATA
12800
6400
3200
1600
NORMAL
(50,000)
800
400
200
100
50
MENTAL DEFECT
-24 -21 -18 -15 -12 -9 -6 -3 0 3 6 9 12 15 18 21 24
INTELLIGENCE
(1=PROBABLE ERROR)

DIAGRAM XIV.

50,000 normal children we should find representatives in them of every grade of memory that we find in the mentally defective. Further, out of *half* this number of normal children we could pick out samples whose memory had the same degree of efficiency as that of each mentally defective child. It is only in a few extreme cases that we should have to collect more than 25,000 to 50,000 normal children to obtain a corresponding number of equally bad memories. We conclude that the average memory of the mentally defective child is worse than that of the average normal child, but it will not serve as a satisfactory factor of differentiation.

We now turn to the maturity tests, and obtain again absolute continuity in the factors of the mind grouped under this heading (see p. 32); with the exception of half-a-dozen children the mentally defectives could all be paired with similar normal children. Thus we conclude again that with respect to these tests there is no means of differentiating a mentally defective child from some one or other normal child, and that the range of normal variation covers practically the whole range of mentally defective variation. I now come to the question of pure intelligence. Here we see a distinct difference from the earlier tests (see p. 33). There is again a continuous grading of the intelligence, there is no break between the normal and mentally defective, and something like half the mentally defectives could, as far as intelligence is concerned, have been picked out without difficulty from the normals, but the range of the mentally defectives continues far beyond the range of the 50,000 normal children from which we suppose them drawn. Dr. Norsworthy, as a result of her observations, concludes that there is no special race of feeble-minded, that they are absolutely continuous, physically and mentally, with normal children, and that they are only extreme cases of normal intelligence. She confirmed her view by repeating her tests after the interval of a year, and she found that—*at their low level*—the mentally defective had progressed, and, what is more, progressed almost as much as the normal children.

Now the question is, what we mean by a 'special or differentiated race'; I should define it to mean that we could not obtain it by any selection from the large mass of the normal material. Now in the case of the mentally defective, we could easily obtain children of their height, weight, and temperature among the normals. We could, out of 50,000 normal children, obtain children practically with the same powers of perception and memory as the feeble-minded. But not out of 50,000, nor out of 100,000 normal children, could we obtain children

with the same defect of intelligence as some 50 per cent. of feeble-minded children. In other words, when the deviation of a so-called feeble-minded child from the average intelligence of a normal-minded child is six times the quartile or probable deviation of the group of normal children of the same age, it falls practically outside the risk of being an extreme variation of the normal population.

Now six times the quartile variation is almost exactly four times the standard deviation or the variability in intelligence of the normal child, and in the next material I am going to discuss, we have shown that the standard deviation in intelligence of the normal child is just about one year of mental growth. It appears to me, therefore, that Dr. Norsworthy's experiment enables us to assert that when the intelligence of a child is below the normal by *four years* of mental growth, then it is safe to assert, that it is not an extreme variation of the normal child. Only 3 children in 100,000, 1·5 in 50,000, should have an intelligence lower than four times the standard deviation, but *half* the mentally defective children in Dr. Norsworthy's experiments were below this level. It seems, therefore, that a carefully planned psychological test, while not sufficing to differentiate 50 to 60 per cent. of the mentally defective from the normal child, would suffice to differentiate 40 to 50 per cent.

I now come to the material which I had intended to make the centre point of this lecture. It is due to a Swedish psychologist, Herr Jaederholm, who came over last year to work at it in my laboratory. He measured the intelligence by Binet-Simon tests of 301 mentally defective children and 261 normal children. The former were practically the whole population of the 'special schools' or 'help-classes', as they are termed, of Stockholm, and the normal children were children in the public schools of that city, who, however, after the age of 9 are subjected to a loss of about 5 to 6 per cent. of the rather abler children who are transferred, partly on account of ability, partly on account of economic reasons, to the Vorgymnasia, or preparatory schools for higher grade education. It is impossible now to discuss the general principle of the Binet-Simon tests, it will suffice to say that Binet gave a series of tests which the average child of a given age could answer. These have been much modified by experience since, and Herr Jaederholm's tests differ very considerably from Binet's original forms, but they are of the same general character. Each child is marked mentally by the grade of tests it can answer. Thus if a child of 7 years old is marked 8·5 years, this means that it

has solved the 8 years tests and done practically half the 9 years tests, it is said to have a mental excess of 1·5 years. Children are thus intellectually graded by their mental excess or mental defect in terms of *years* of intellectual growth for the average normal child. Now it has been objected to the Binet system that a year's growth is a different thing at different periods of life, and that the whole Binet system is therefore worthless. This is how Mr. Cyril Burt treats the Binet hypothesis in a recent paper in the *Eugenics Review* :[1]

" Except for rough and popular purposes, any measurement of mental capacity in terms of age is unsatisfactory. Who would measure height and weight in terms of years ? The unit fluctuates in its significance all along the scale. When the child is just beginning to walk and talk, when he is 7 or 8, when he is 10 or 11, when he is on the verge of puberty . . . at these different periods a retardation of a single year means very different things."

Can the psychologist to the London County Council ever have seen the growth curves of children, or would he write thus ? I put first (p. 37) before the reader the British Association curve of heights for 29,406 persons ; he will see that from the age of 2 to 18 no better description than a line could possibly be found. An average year's growth is sensibly the same from 2 to 18. Weight is less linear than height, but from 5 to 15, an average year's growth is for all practical purposes the same quantity (see Diagram XV, p. 37).

Now take the measurements of the head growth, which might be supposed to be correlated with the growth of intelligence. The growth is quick in the auricular height of girls from 3 to 6 and slow from 15 to 20, but is sensibly linear from 6 to 15. This holds substantially for all head measurements (see Diagram XVI, p. 38).

Head-breadth for boys is absolutely linear from 8·5 to 18, and I expect from 4 to 18, because I was able to get relatively few of the younger children in my 2,000 boys and the data are thus irregular (see Diagram XVII, p. 39). Head-breadth for girls 6 to 18 and head-length for boys 5 to 19 are as linear as any observations of moderate numbers are likely to be (see Diagrams XVIII and XIX, pp. 40 and 41). No curve better than a straight line could be found to represent average physical growth between 6 and 16 in children, and a year's growth is an absolutely valid and scientific unit when determined on a big sample of either head-growth or stature-growth. There is no valid reason to suppose that a year's growth in mental

[1] Vol. v. p. 364.

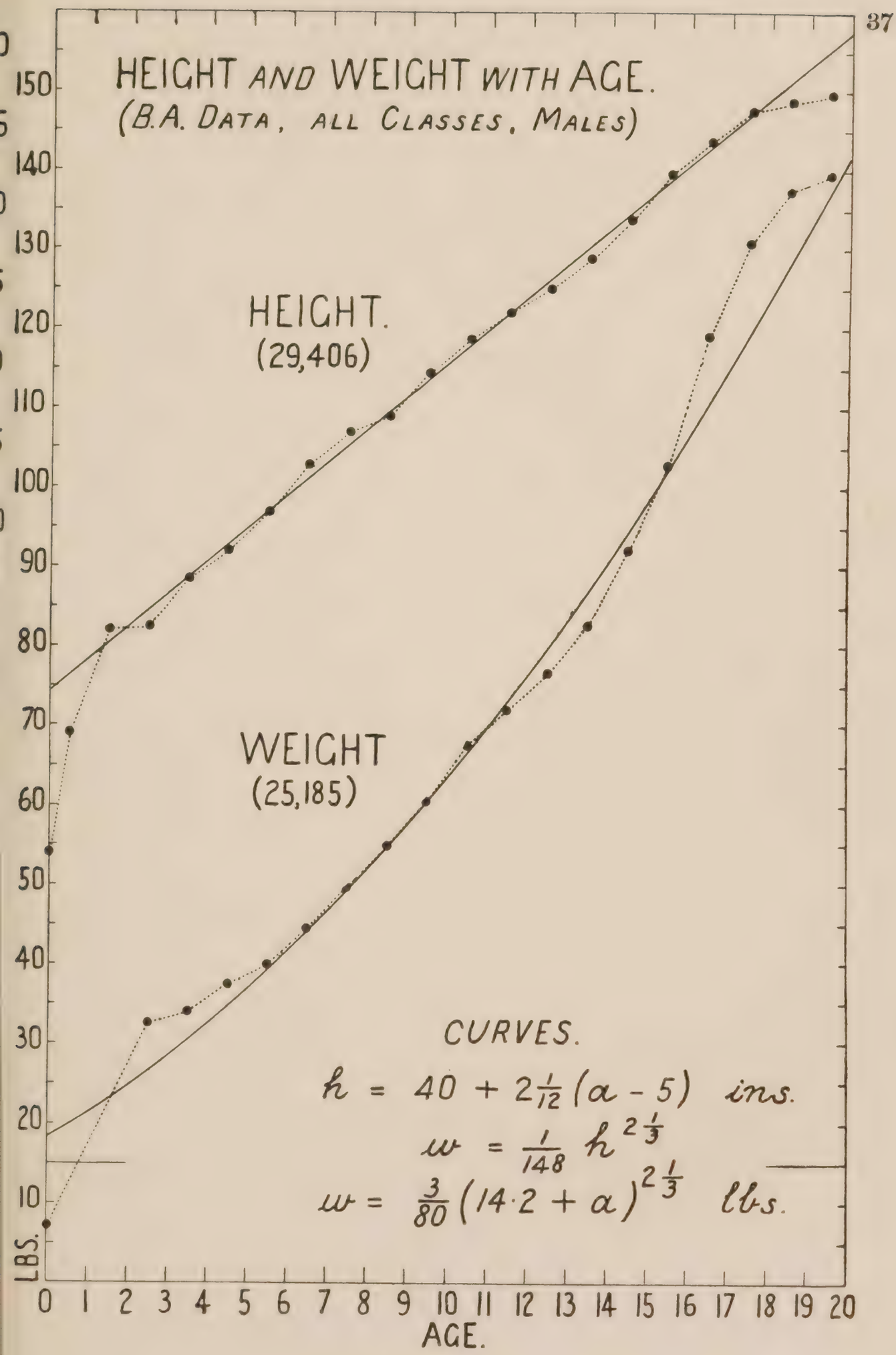

HEIGHT AND WEIGHT WITH AGE.
(B.A. DATA, ALL CLASSES, MALES)
HEIGHT.
(29,406)
WEIGHT
(25,185)
CURVES.
$h = 40 + 2\frac{1}{12}(a - 5)$ ins.
$w = \frac{1}{148} h^{2\frac{1}{3}}$
$w = \frac{3}{80}(14{\cdot}2 + a)^{2\frac{1}{3}}$ lbs.
LBS.
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
AGE.

DIAGRAM XV.

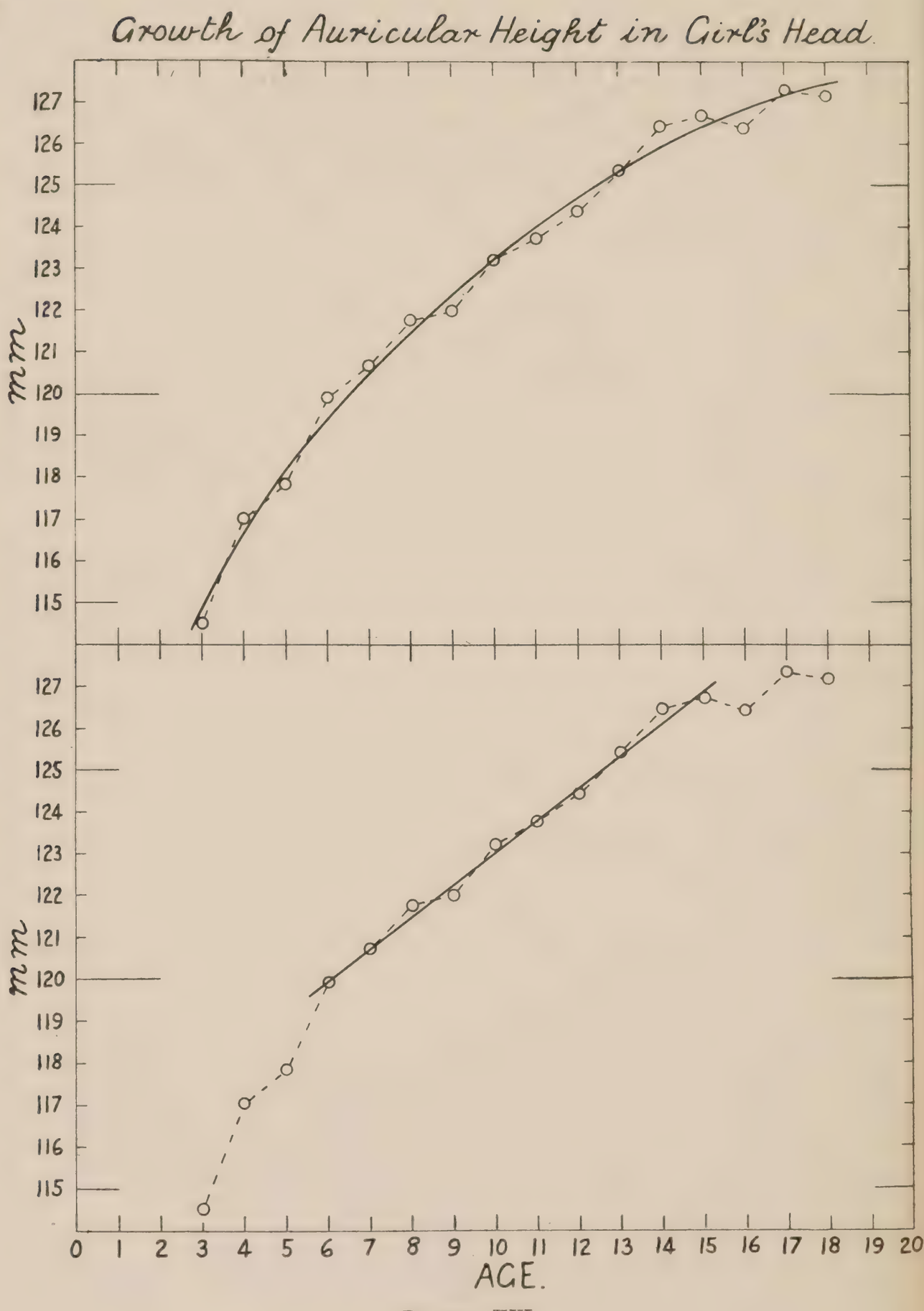

Growth of Auricular Height in Girl's Head.
mm
127
126
125
124
123
122
121
120
119
118
117
116
115
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
AGE.

Diagram XVI.

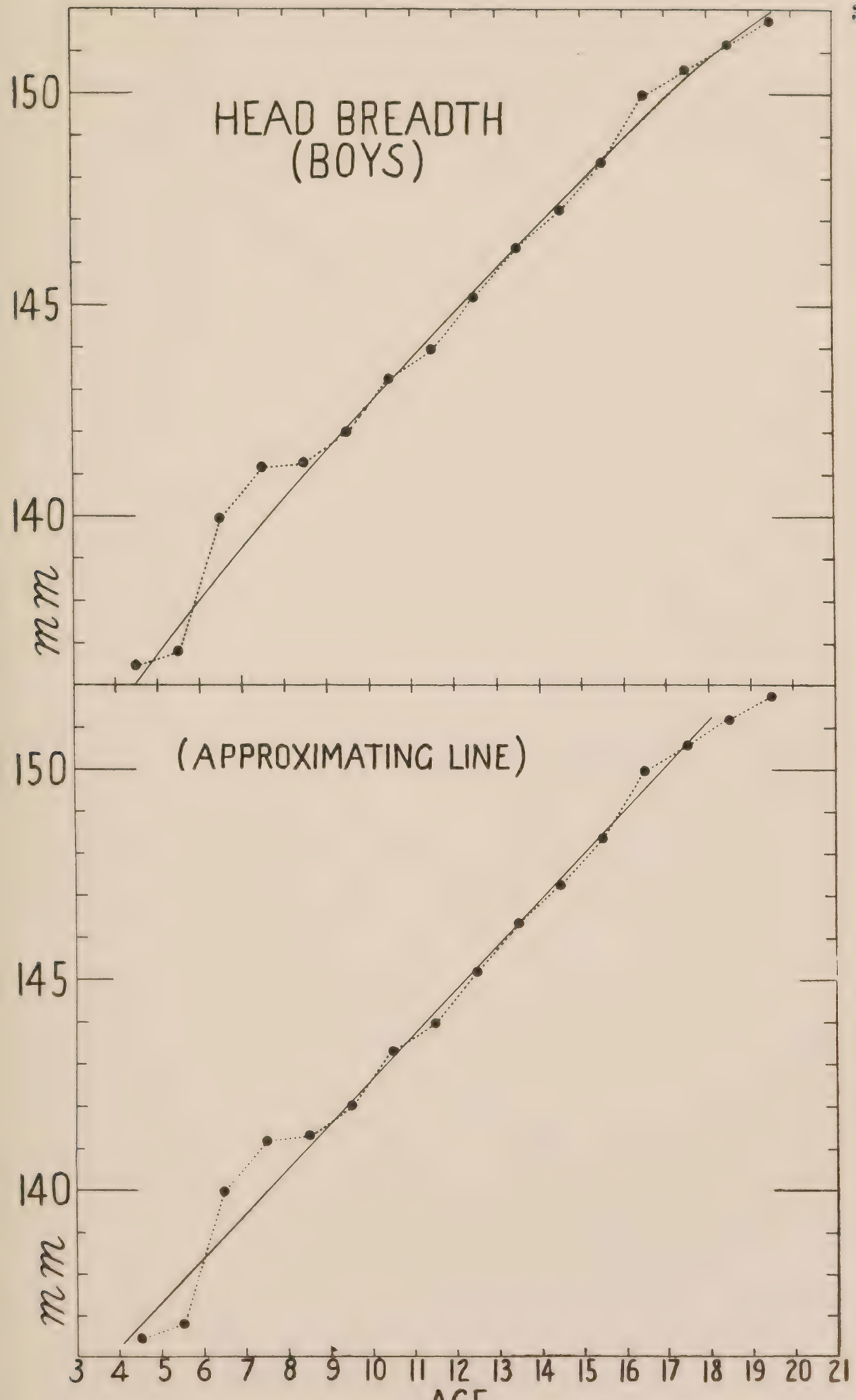


Diagram XVII.

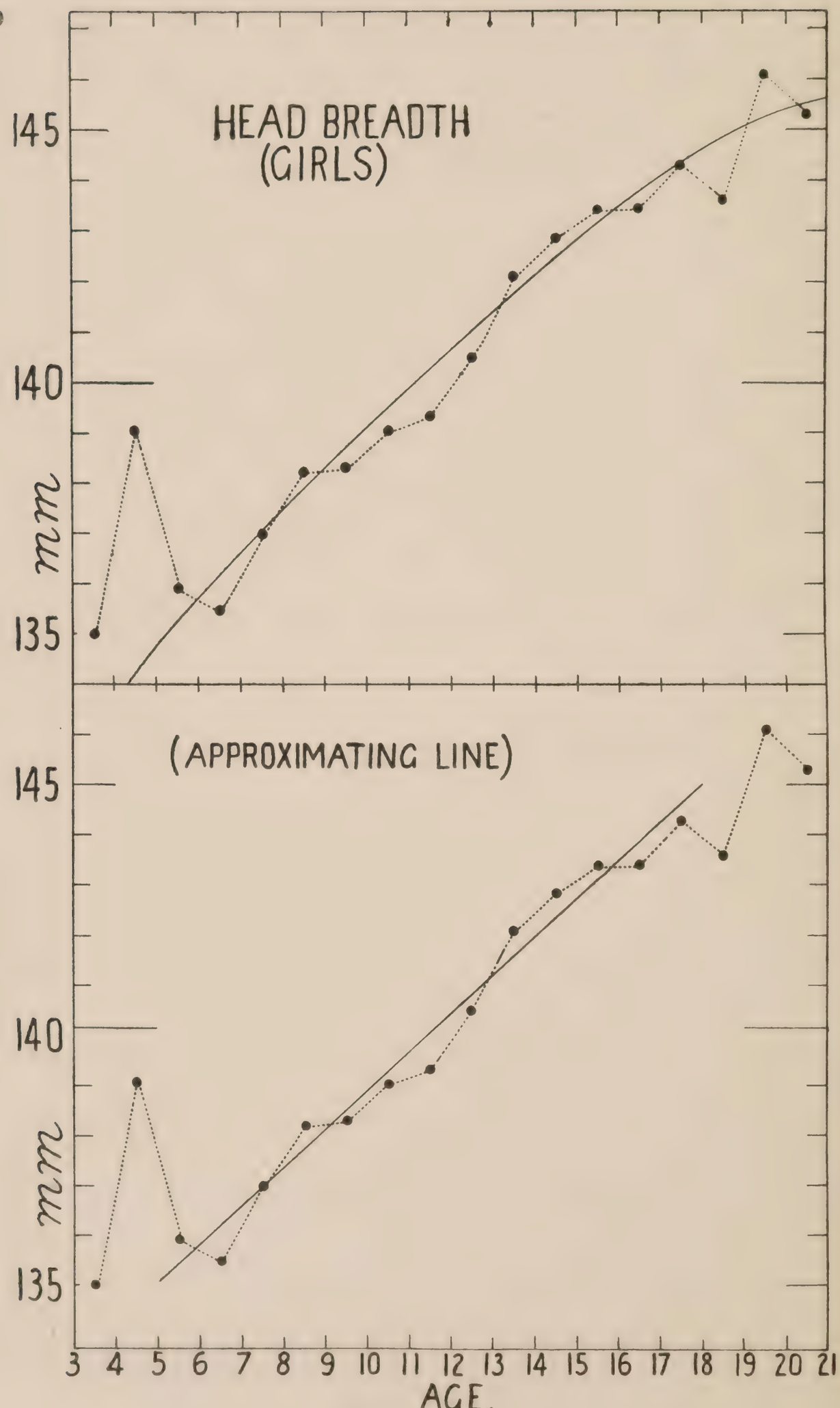


Diagram XVIII.

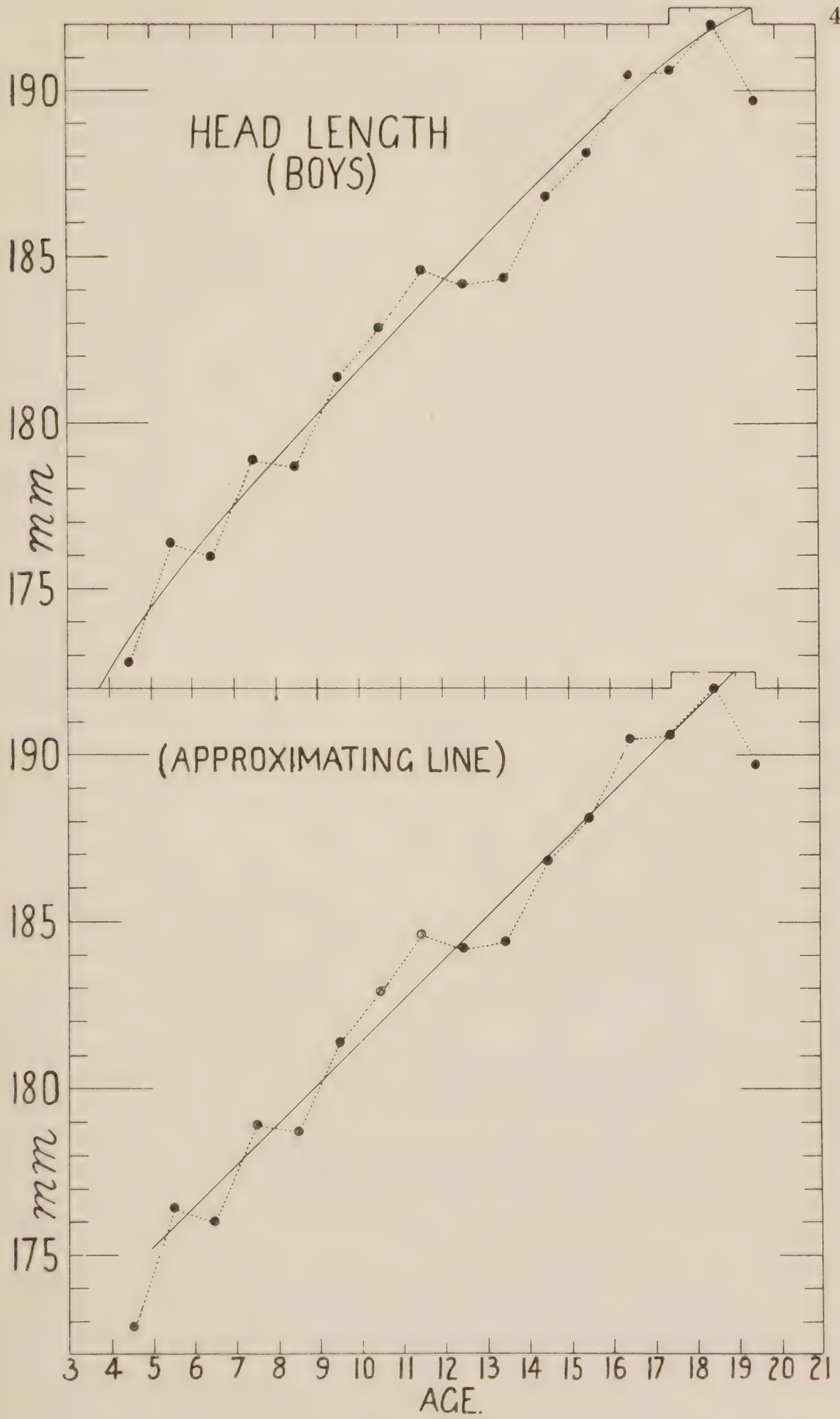

HEAD LENGTH
(BOYS)
190
185
180
175
mm
(APPROXIMATING LINE)
190
185
180
175
mm
3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
AGE.

Diagram XIX.

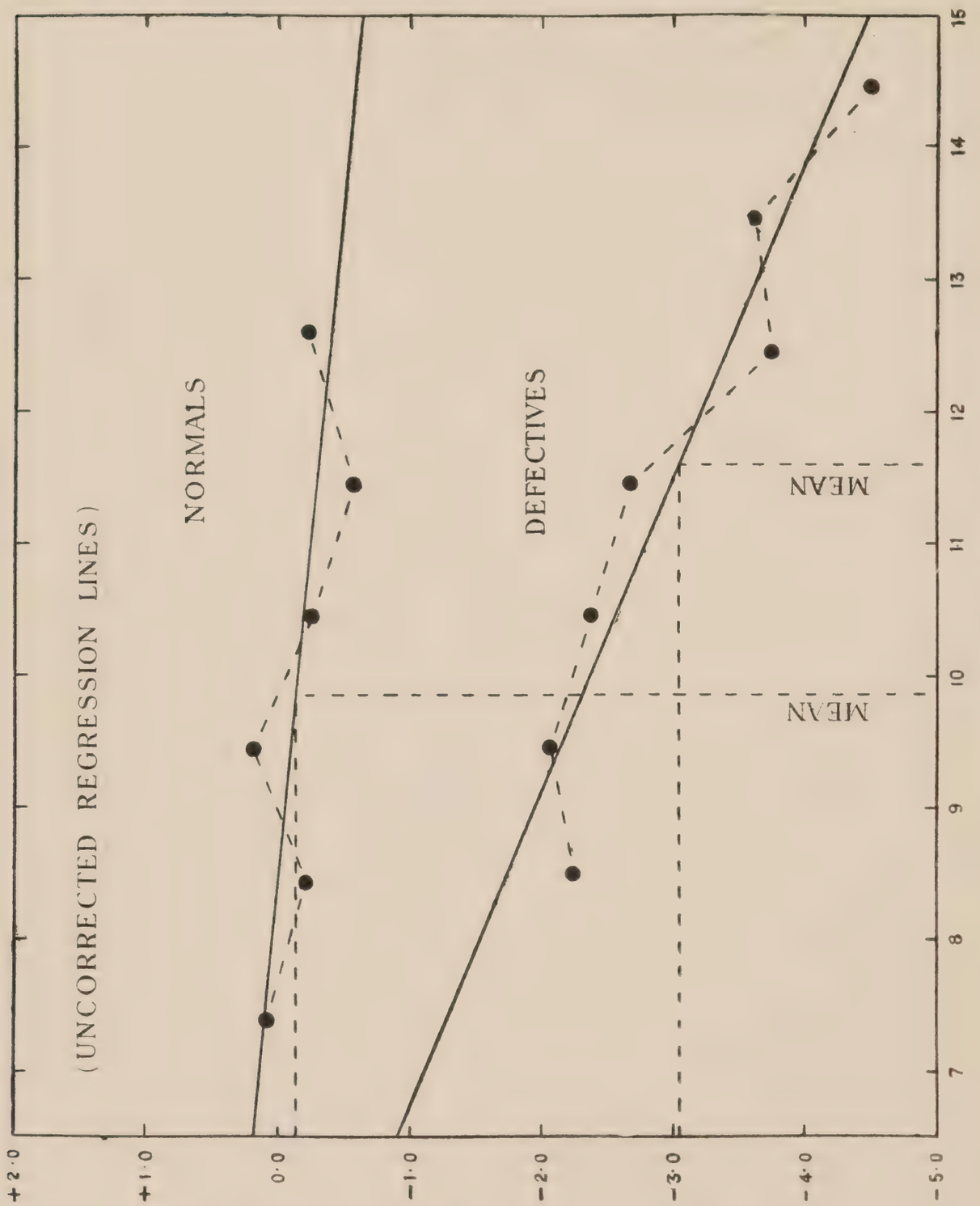

(UNCORRECTED REGRESSION LINES)
NORMALS
DEFECTIVES
MEAN
MEAN
+2·0
+1·0
0·0
−1·0
−2·0
−3·0
−4·0
−5·0
7
8
9
10
11
12
13
14
15
Physical Age (Unit Years)
Mental Excess = Mental Age − Physical Age.
(Binet - Simon Test.)

DIAGRAM XX.

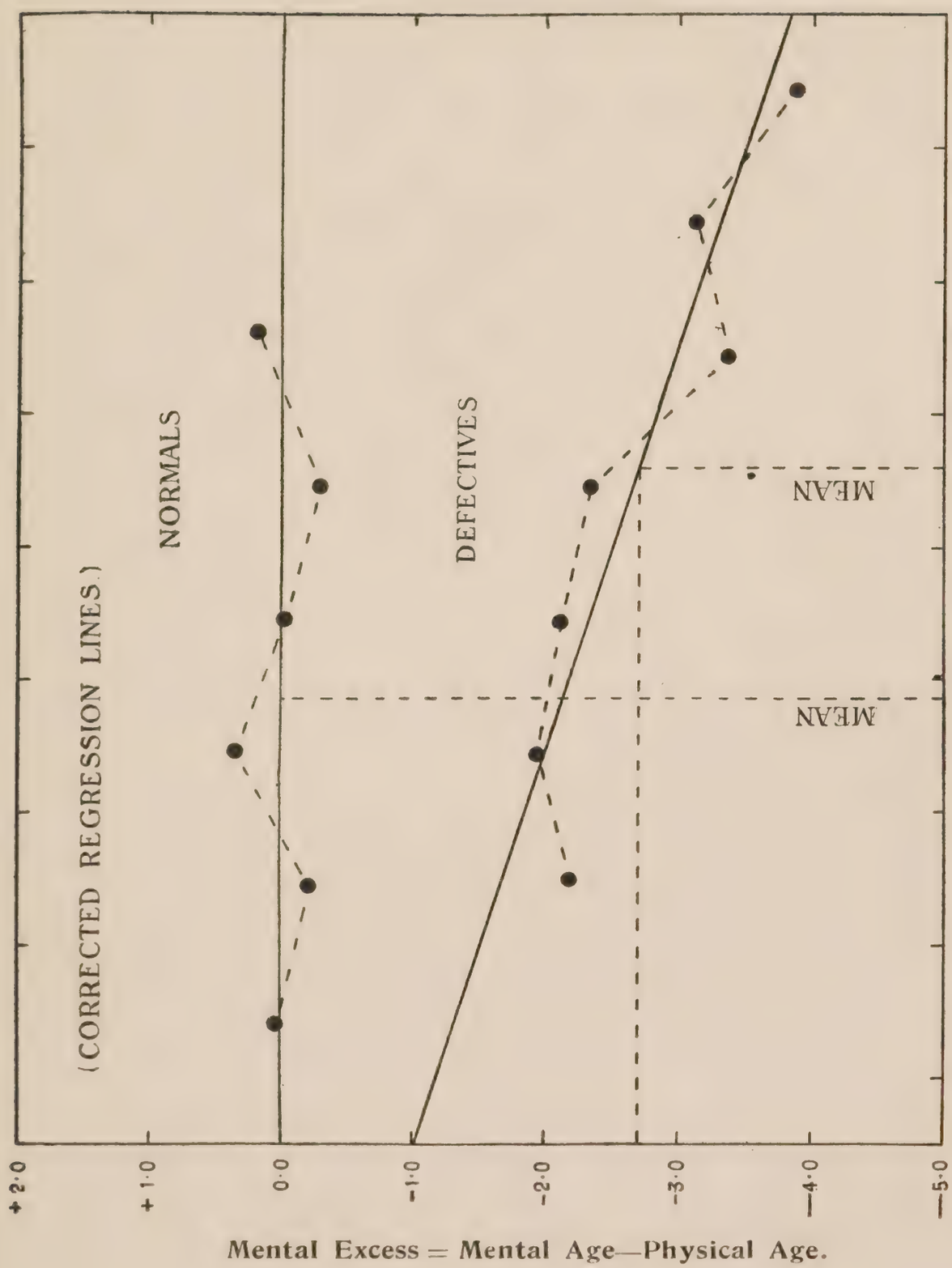

(CORRECTED REGRESSION LINES.)
NORMALS
DEFECTIVES
MEAN
MEAN
+2·0
+1·0
0·0
-1·0
-2·0
-3·0
—4·0
—5·0
7
8
9
10
11
12
13
14
15
Mental Excess = Mental Age—Physical Age.
Physical Age (Unit = Year).

DIAGRAM XXI.

power may not be taken for all practical purposes to mean the same unit for ages of 6 to 15, the period for which Binet and Jaederholm have used the tests.

But the need for normal children of, say, 10 physical years, being exactly 10 mental years old is of no real importance *at all*. The age is simply an artificial measure of marking the tests passed, and we have only to add so many marks to our marking of each age to make the physical and mental ages in the normal group identical. I illustrate this on Herr Jaederholm's observations.[1] In Diagram XX (p. 42) we have the uncorrected mental excess or defect, as the case may be, of children from 7 to 15. We see at once that even with our modified tests a year of mental age is not equivalent to a year of physical age; there is an increasing mental defect as the normal children grow older, but the data cannot be represented by anything better than a straight line. The mental excess of the normal children is, on the average, 2 months' defect, and it increases by about a month per year of life. But the mental defect of the mentally defective children is, on the average, 3 years, and they lose about 5 months per year. Again, the change is almost linear. Thus we see that in both these series the unit a year of mental growth receives support from the data as a constant quantity, and the Binet hypothesis that there is no correlation between mental excess and physical age is nearly justified for the modified tests.

In Diagram XXI (p. 43) we see the mental ages corrected for the two months per year, we found the normal child was, on the average, in defect of the series of tests. After this correction the physical age of the normal child is seen to be uncorrelated with its mental excess, but the mental defectives show an average mental defect of 2·7 years and a loss of four months for every year's increase of physical age. The mentally defective child does not cease to progress; it loses on the average out of every three years one year of intellectual growth. Thus a mentally defective child of 12 is, on the average, the equal of a child of 8.

I now turn to the actual distribution of mental defect and excess in the populations of feeble-minded and of normal children. I have treated Dr. Jaederholm's measurements in precisely the same manner as I have previously treated Dr. Norsworthy's. Namely, I have determined the mean mental age and the standard-deviation in years of all normal children of each physical age-group. I have then measured

[1] *Questions of the Day and Fray*, No. VIII.

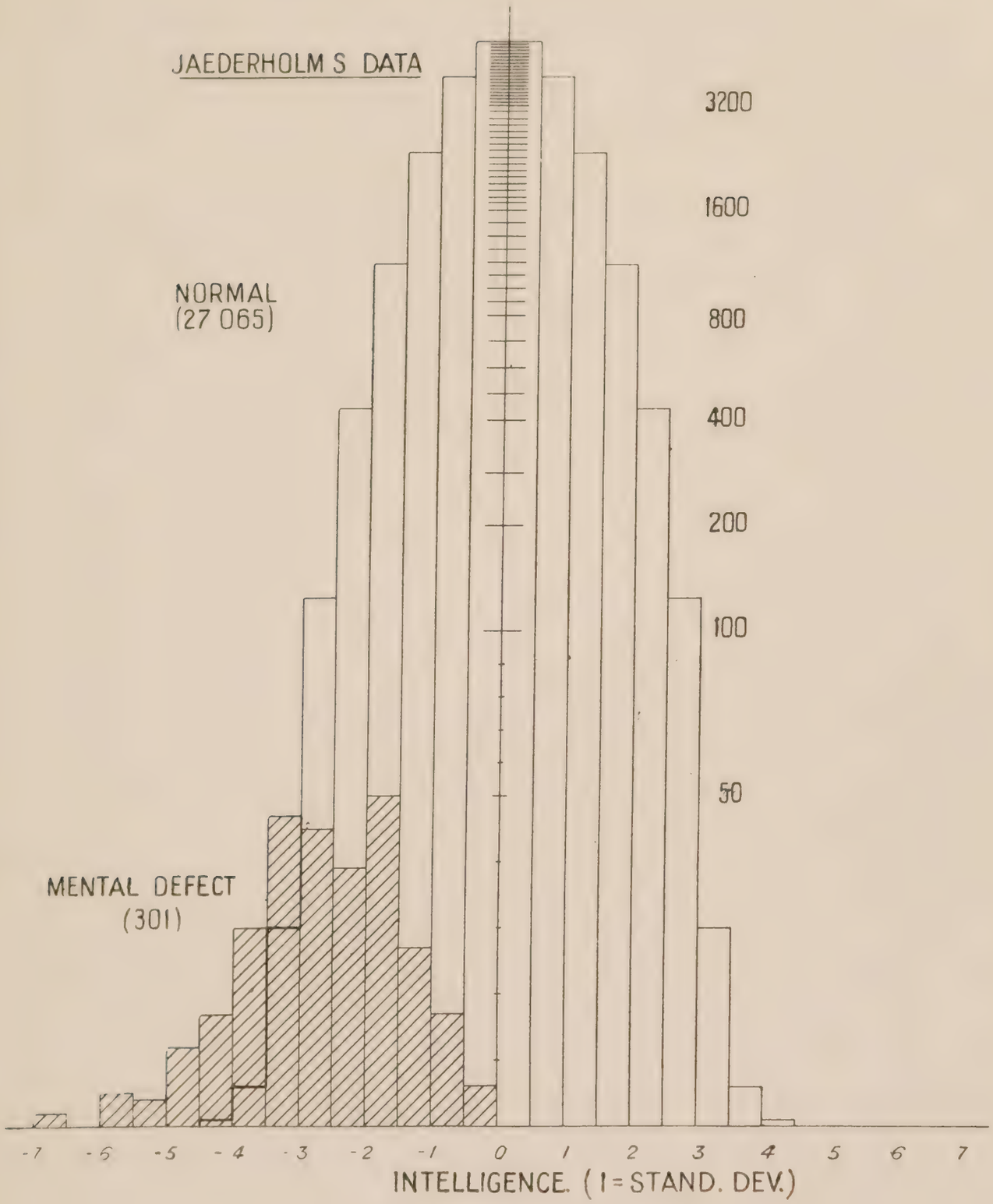


DIAGRAM XXII.

the deviation of the mental age of each mentally defective child from the mean mental age of the normal children of its own physical age, and divided this deviation by the standard deviation of the mental age of the normal children of its own physical age. This reduction to a common unit enables me to pool all the data together for all physical ages.[1]

Diagram XXII (p. 45) shows the distribution of the mentally defective 301 children in relation to the 27,065 normal children from which they were selected. The average standard-deviation of the normal children's groups is ·98 of a year in mental age. Thus the horizontal scale may, if preferred, be taken as approximately years. It will be seen at once that 61 per cent. of the mentally defective, i.e. those up to about *three* years of mental defect, could be at once picked out of the 27,000 odd normal children, and this many times over, as far as measurement of intelligence goes. Another 20 per cent. to 30 per cent. could be intellectually matched from those treated as normal, i.e. those from 3 to 4 or 4·5 years of mental defect; while finally, 10 per cent. to 20 per cent., or those from 4 to 4·5 years and beyond of mental defect, could not be matched at all from 27,000 children.[2] Thus as far as the best available test for intelligence goes we conclude :

1. That there is no discontinuity in mental defect, but any classification of children as mentally defective below four years of mental defect must either depend (*a*) on personal equation of the recorder, or (*b*) be settled by other factors than intelligence, such as moral or physical deficiency. There is little doubt that both these factors are contributory.

2. That it is only the extreme 'tail' of the mentally defective distribution, say 10 per cent. to 20 per cent., that can be differentiated safely on the basis of intelligence from the normal population of children, and although this can be done by the modified Binet-Simon tests, yet this 'tail' is perfectly continuous with the other 80 per cent. to 90 per cent. of mentally defective children; it is only differentiated by the fact that it cannot be matched by what are termed normal intelligences.

As further illustration of this fundamental continuity in mental defect I exhibit in Diagram XXIII (p. 47) some statistics of mental defect

[1] There are, however, relatively little differences in these mental age standard-deviations of the normal children beyond what we may attribute to the effect of random sampling. The same remark is approximately true also of the means.

[2] The reader will note how closely the Binet-Simon tests agree with the result of Norsworthy's very different methods.

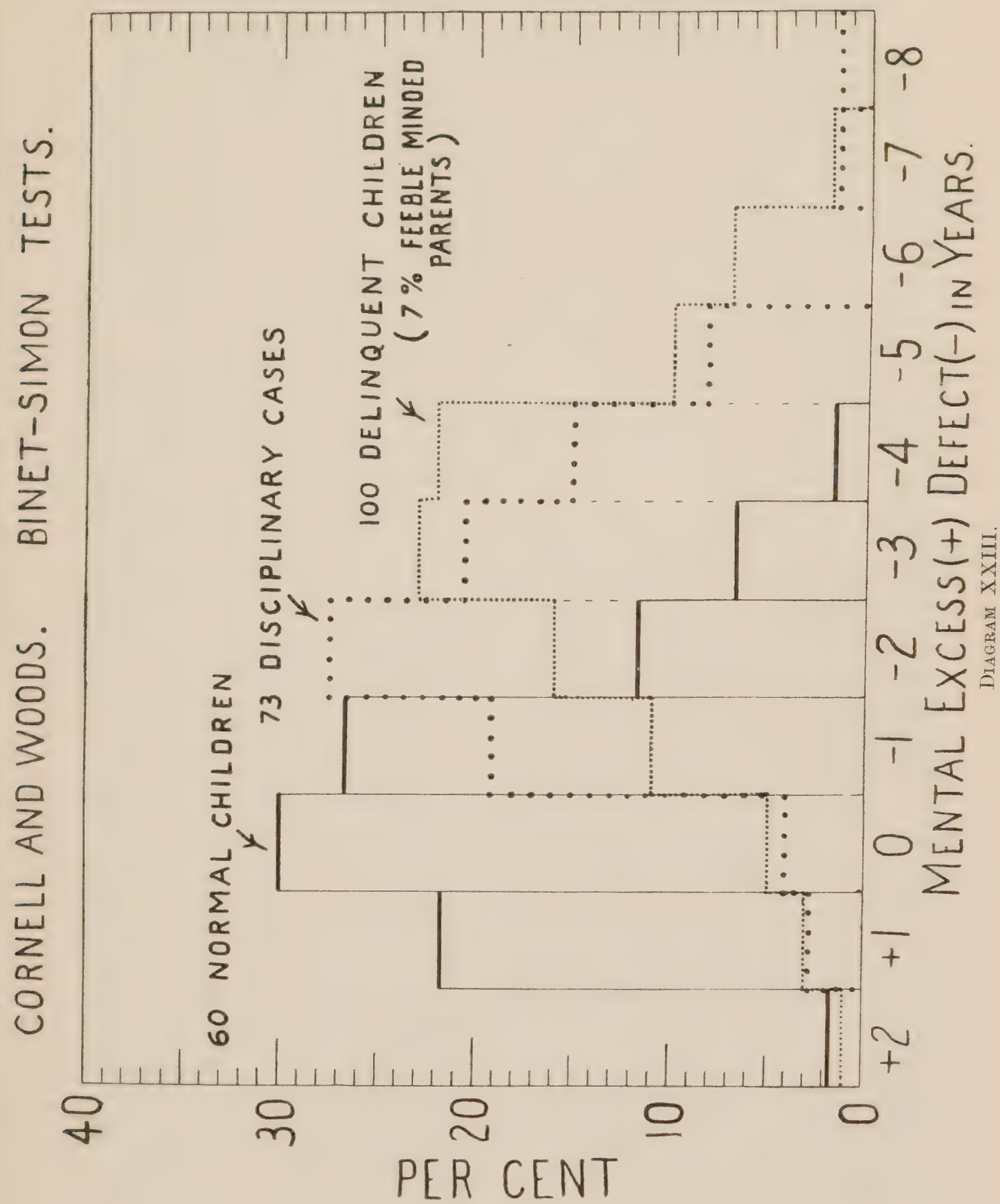


DIAGRAM XXIII.

in three classes of children provided by Cornell and Woods.[1] They are not very ample, but they indicate how normal children in the matter of intelligence pass continuously without the least breach of continuity into the group of children requiring disciplinary treatment, and these into the group of delinquent children. But by the time we have got to the delinquent children we have reached a mental defect markedly in excess of that of the mental deficients of the Swedish help-classes; further, we see how close is the relation between mental defect and the origins of criminality. But even here it will be seen that an arbitrary limit of four years of mental defect would cut out a few normal children, would leave the bulk of disciplinary cases untouched, and would not more than bisect the delinquents.

Now the Swedish children I have spoken of above are selected for the help-classes much as our own children are for the special schools. Their percentage is 1·23, which lies between that of Liverpool, 0·73, and that of London, 1·30, and they are selected practically for the same reason, i.e. because they are 'school inefficients', the bulk of whom will, no doubt, unless specially provided for, become 'social inefficients'. But this selection is not really based on a purely intellectual or mental test. How large is the personal equation in determining what is a 'school inefficient', and how diverse will be the opinion of the medical men who have to certify 'feeble-mindedness'? They will actually be placing their dividing line at anything from 2 to 6 years of mental defect; they will really be making utterly different guesses as to whether a child will be able to earn its livelihood, or will come to moral collapse, if allowed its freedom. I have been told by authority in this country, that medical men can certainly distinguish the feeble-minded from the normal, and that they know by experience whether a child will be able to face the world or not. But in America, where several states already have segregation laws, this is not the opinion of those of greatest knowledge. Dr. Murdoch writes: "I do not know of any way to draw a definite line between a backward and a feeble-minded child. We, as I understand it now, consider those children who are so defective that they can never be trained to take a place in the world as feeble-minded; and those who may be trained so that they can take a place in the world as backward children. Now we cannot draw a definite line between these two classes. There are all grades of deficiency between the bright children and the extreme 'below grade' idiots. We can only use our best judgment in determining

[1] W. S. Cornell, *Health and Medical Inspection of School Children*, 1912, p. 436.

which ones are capable of going into the world and which ones are not."[1]

Dr. Fernald throws over medical in favour of legal judgment. He says: "The Court must settle it after hearing our opinions and beliefs. No institution can with dignity wilfully detain a person about whom intelligent people differ."

Dr. Keating found the only solution in the discharge at adult age, and thus finding by experience whether the individual was capable of taking charge of his or her own self. They must come back if they did anything criminal. The objections to this experimental stage, not only from the standpoint of society, but of the individual, are too obvious to need comment, but the opinion expressed indicates how hard is the problem.

Dr. Wilmarth states: "There is no sharp line. If there were, there would be no problem at all. It would be a question of measurement. It is a straight question of judgment, and on whose judgment we shall rely."

Dr. Fernald discharged 10 or 12 cases after 5 to 10 years in the home, and all believed that these female moral defectives would lead a life of shame or have illegitimate children; but in this case all the girls managed to get along. Other batches elsewhere have shown how disastrous such experimental freedom can be. Finally, I may quote Dr. Rogers, who remarked on this statement of Dr. Fernald's, 'that the wisest men and women in the world of experience are often mistaken in their prognostications of what these "borderland" cases will do.'

I have quoted these opinions of men intimately associated with mentally defective colonies in America, because we shall be told that it is a medical problem, and I want to indicate that it is far from being wholly a medical problem. The 'mental defectives' are not differentiated from normals by mentality, but they are segregated because they are social inefficients; and the sooner we recognize that it is social inefficiency in a broad sense that we are seeking to draft out of ordinary life the easier will be our task of carrying out the spirit of the mentally defective bill. It is easy to make a mental test—say four years' mental defect—which will strain off say 20 per cent. to 30 per cent. of the so-called feeble-minded; but it won't touch some 70 per cent. to 80 per cent. of the group, who have memory and intelligence equal

[1] For these statements see *The Journal of Psycho-Asthenics*, vol. x, pp. 203 *et seq.* and elsewhere.

to the normal, but lack, say, self-control proportional to the force of their anti-social instincts. If our definition of the person to be segregated be he 'who is incapable of competing on equal terms with his normal fellows or managing himself or his affairs with ordinary prudence', we must have some manner of measuring who is fit or who is not fit to compete on equal terms—we must demonstrate on which side of some line a given person stands. I do not defend the definition—no two normal individuals compete on equal terms, the definition is indeed very bad—but short of the trial by experience of the individual, we must have some standard by which to judge the socially inefficient. I have shown you that it cannot be a mental test, that will only exclude some 20 per cent. or 30 per cent. of the people we have to deal with. We want tests of self-control, and of emotions and feelings in relation to social duties. Such tests of 'moral judgment' will be no doubt forthcoming as well as 'tests of self-control', when the psychologist realizes how badly they are needed for practical purposes. At present they can hardly be said to exist, and until we get them, segregation will be a matter largely of personal equation.

My aim in this lecture has been to show you that the feeble-minded in bulk—if we exclude special types of idiots—are not a special race, sharply differentiated from normal-minded folk. There is every grade of feeble-mindedness, and as no one has yet investigated how these various grades are inherited, it is idle to speak of feeble-mindedness as a Mendelian recessive; it is merely a term used to cover the lower grades of a perfectly continuous intelligence character, and as far as mentality is concerned no sharp line can be drawn across the population, and those on one side of it treated as normal and those on the other as mentally defective. It is a matter of practical utility where we draw the line which shall legally define mental defect for purposes of segregation. It certainly should not be done under four years' mental defect judged by adequate Binet tests. This will only cut off about 20 to 30 per cent. of those classed at present as 'feeble-minded' in the special schools. The remaining 70 to 80 per cent. may be, and probably are, incapable of fending for themselves in ordinary life; they also are 'socially inefficient', but ultimately, on other grounds, temperamental or moral, not merely intellectual: they take a view of life which is in distorted perspective, and they are out of harmony with their economic or social surroundings. They may be more dangerous than those in whom the true *mental* defect

is far greater, and they may more urgently stand in need of segregation. We only obscure the matter by classifying them with the true mental defectives, or by supposing that at the present time anything but the individual and often arbitrary opinion of teachers and medical men is available to differentiate this class from the normally minded; this opinion is a rough appreciation not of intelligence but of social efficiency. That a real measure will be found—short of the experimental method of testing actual success or failure in the rough and tumble of life—I am convinced, but I doubt whether it has been found at present, and its discovery will not be expedited by any scientific dogma that asserts all mental defect is of one kind, and is due to the absence of a determiner, a lack which the feeble-minded share with our ape-like ancestors.

NOTE TO PAGE 13.—Of the 15 matings referred to in which one parent was neuropathic while the other was normal and not known to be of neuropathic stock, there are *eleven* in which there was at least 1 feeble-minded child, in three other cases there was at least 1 alcoholic child, and there is Davenport's third case in which alone there is no child with patent taint. Actually the 15 matings gave rise to 45 children, whose mental condition is reported; 19 of these were feeble-minded, 3 alcoholic, 1 feeble-minded and alcoholic, 1 neurotic, and 21 normal. Out of this mass of tainted descent, Davenport selects two cases, quite arbitrarily, to illustrate the effect of the mating of the feeble-minded with 'true' normals.

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